NASA

Technical Memorandum 78042

AOIPS Data Base Management Systems Support For GARP Data Sets

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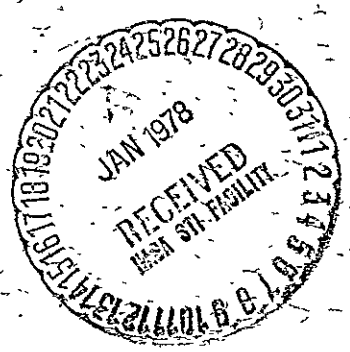
(NASA-TM-78042) AOIPS DATA BASE MANAGEMENT SYSTEMS SUPPORT FOR GARP DATA SETS Technical Report, Oct. 1976 - Sep. 1977 (NASA) 86 p HC A05/MF A01 CSCL 04A

N78-15629

Unclas G3/46 57922

OCTOBER 1977



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1. INTRODUCTION

This report identifies the data base management system developed within the Computer Systems Branch (Code 933) of the Goddard Space Flight Center to provide flexible access to data sets produced by the Global Atmospheric Research Program (GARP) Project during its Data Systems Tests (DSTs). This support basically consists of: (1) maintaining a local archive of the full data base stored on magnetic tapes, (2) developing and maintaining a computer-aided, interactive information storage and retrieval system to facilitate access to user specified data subsets, (3) assisting user perusals and interpretation of the data base content, and (4) preparing and distributing data tapes and associated documentation describing the content and format of any original or reformatted data requested by a research investigator.

Computer programs developed to provide this support capability have been implemented on the highly interactive, minicomputer-based Atmospheric and Oceanographic Information Processing System (AOIPS) of the Applications Directorate at Goddard Space Flight Center and are referred to as the Data Retrieval System (DRS). A fundamental design principle which has guided the DRS development and successful implementation has been a basic data base management system design goal to provide efficient user access to specific, pertinent data without burdening the user with myriad details concerning

tape or disk resident data formats and structures.

Implemented as a user interactive but menu guided system, the DRS permits users to inventory the data tape library and create duplicate or subset data sets based on a user selected window defined by time and latitude/longitude boundaries. The DRS permits users to select, display, or produce formatted hard copy of individual data items contained within the data records. The DRS selection function is designed syntactically and supports user selection by single data items or by a start/end range of data items with an optional increment feature. Users may also produce temporary or permanent disk files of selected data for follow-on research studies.

The AOIPS data base management system described in this report has already been utilized to prepare and distribute data products to a variety of in house and GARP Project approved outside investigators. Furthermore, with the May 1977 issuance of the Announcement of Opportunity for GARP Applications of Global Data Sets and the expanding in house interest in the data from personnel supporting the VAS Demonstration Project and the Severe Storms Research Program, it is expected that the data request work load for this support will continue to increase.

The remaining sections of this report provide additional information detailing the data base management system support. Section 2 provides a brief background to the collection of the data sets. Section 3 defines content, coverage, and formats of the data sets maintained in the local tape archive. Section 4 describes the support capabilities provided by the DRS and Section 5 closes with a brief description of future DRS enhancements. Separately prepared DRS User's Guide and DRS Program Design documents are also referenced for user interest.

2. BACKGROUND TO DATA SET COLLECTION

The GARP data sets discussed in this report were collected during a series of experiments designed to be a broad operational test of many of the proposed concepts, elements, and interfaces involved in the observation, data management, and data utilization systems planned for the First GARP Global Experiment (FGGE). The goals, approach and detailed plans for these tests may be found in the GARP Project Data Systems Test Plan (Reference 1).

Briefly, these tests were planned as a series of increasingly more sophisticated checkout tests providing a pre-FGGE opportunity to uncover difficulties and to provide solutions in the many new areas of activity involved. The basic approach followed in each DST was to use current operational

satellite and conventional meteorological data along with the data from appropriate research and development meteorological satellites, to approximate the elements of the proposed FGGE observation system and to provide a cross section of the expected data inputs for FGGE.

An early perceived benefit of the DSTs was the collection of global sets of meteorological data better than any that have been obtained previously.

Table 1 provides a brief reference to the time and type of activities covered by the 6 separate DSTs. A thorough report describing the plans, operations, and preliminary results of DST-2 is contained in Reference 2. However, the most significant DSTs were DST-5 and DST-6 which obtained processed data from the Nimbus-6 spacecraft launched on June 12, 1975.

While each of the last two DSTs were scheduled and executed over 60 days, the permanent data archives resultant from these tests have been limited to include only those periods when the Nimbus 6 data was most fully processed. Hence, for DST-5, the archival data coverage period is from August 18 through September 4, 1975 and for DST-6 is from February 1 through March 5, 1976.

Table 1: DATA SYSTEM TESTS ACTIVITIES

	DATE	LENGTH	DATA	PURPOSE
DST-1	DEC '73	3 DAYS	CONVENTIONAL, OPERATIONAL SAT (SOUNDINGS, SST, ATS-WINDS), NIMBUS 5 SOUNDINGS	SUBSYSTEM CHECKOUT 1. COMMUNICATIONS 2. SOUNDING PROGRAMS 3. DATA SET PROCESSING
DST-2	MAY '74	30 DAYS	SAME AS DST-1 PLUS GLOBAL ANALYZED FIELDS AT 00Z AND 12Z FROM NEW 8L FORECAST MODEL	DATA SETS FOR: ASSIMILATION STUDIES IMPACT STUDIES FORECAST MODEL STUDIES
DST-3	OCT '74	5 DAYS	SAME AS DST-1 EXCEPT SMS FOR ATS PLUS U/WISC WINDS	CHECKOUT OF U/WISC WIND DATA PROCESSING
DST-4	JAN-FEB '75	60 DAYS	SAME AS DST-3 PLUS SEA ICE AND RAIN RATE	SAME AS DST-2
DST-5	AUG-OCT '75	60 DAYS (18 DAYS ARCHIVED)	SAME AS DST-4 EXCEPT NIMBUS 6 FOR NIMBUS 5 PLUS TWERLE, CABALS, AND AIRLINE OBS.	SAME AS DST-2
DST-6	JAN-FEB '76	60 DAYS (34 DAYS ARCHIVED)	SAME AS DST-5 PLUS DRIFTING BUOYS	SAME AS DST-2

3. ARCHIVAL DATA SET CONTENT

3.1 Definition of Levels

Data sets contained in the local archival tape library are grouped according to three levels generally defined as follows:

Level I: Raw Data or Observations. These are defined to be the numbers obtained from direct reading of instruments or from conversion of telemetry signals by calibration or conversion algorithms. Examples of such observations are: radiosonde and rawinsonde records, calibrated radiances from infrared and microwave spectrometers and radiometers, cloud cover images from satellites, and data relayed from automatic platforms. In some of these observations, particularly with remote sensing data from satellites, a prior level of data manipulation has already been introduced. This preprocessing must be considered as part of the observing system since it must be done by those responsible for the observations before anyone else can use the information. Thus, most satellite data must be preprocessed before they can be called Level I.

Level II: Determinations. These are meteorological parameters, at the actual time and place of observation, converted to standard data formats where applicable. Examples are: temperature or moisture profiles as determined from radiances; winds determined from analysis of sequential cloud images; winds derived from sequential balloon positions; wind, temperature, humidity, and heights of standard levels; inferred wind and humidity fields from cloud maps; and surface pressure, temperature, wind, and humidity in standard formats.

Level III: Initial State Parameters. These are the values (or the harmonic components for those models using wave number space) of the atmospheric state parameters derived from the Level-II determinations at preselected set of geographic grid points for use in numerical models. The initial state parameters, wind velocity, temperature, pressure, water vapor, sea surface temperature, ground temperature, etc., are usually derived with the aid of numerical models.

3.2 Account of Archival Data by Level Type

A complete directory listing of the AOIPS data tape library of GARP data sets is included in Appendix A. This list may be utilized by research investigators to

review the general extent and type of data coverage maintained in the data base. A brief description of the general characteristics of these data is presented below.

3.2.1 Level I Data

This data base contains orbital archives of calibrated radiances and parameters derived from the High Resolution Infrared Radiometer Sounder (HIRS) and the Scanning Microwave Spectrometer (SCAMS) instruments flown on board the Nimbus 6 spacecraft. Data are saved in an orbit by orbit basis with generally 4 orbits stored per tape. Each orbital set contains three types of data: (1) calibrated and earth located HIRS radiances per individual field of view of approximately 30-55 km resolution, (2) calibrated and earth located SCAMS radiances per individual field of view with approximately 180-380 km resolution, and (3) sounding retrieval data obtained by processing the calibrated HIRS and SCAMS data through the clear column radiance and retrieval algorithms developed by Dr. W. Smith and H. Woolf of the National Oceanic and Atmospheric Administration (NOAA)/National Environmental Satellite Service (NESS). The sounding data sets also include estimates of clear column radiances, surface albedo, cloud parameters and long wave flux at approximately 300 km resolution.

Complete details of the data content and record format of the Level I data are contained in Appendix B. A sample inventory and coverage map produced by the DRS of the retrieved sounding data on the first Level I tape archived for DST-5 are shown in Table 2 and Figure 1, respectively.

3.2.2 Level II Data

This data set contains 6-hour collections of all National Weather Service (NWS) acquired surface, upper air (including radiosonde), and operational satellite (SMS/GOES and ITOS) reports and special NASA acquired research data sets collected or derived from Nimbus and SMS/GOES satellites and special aircraft reports.

The Level II data sets are organized such that two days' complete data are stacked as multiple files on a tape. Each day contains four files of upper air data and four files of surface data where the four file sets are centered about 00, 06, 12, and 18 UT synoptic times. The surface file contains:

Table 2. Sample Inventory of a Level I Data Tape

D A T A B A S E I N V E N T O R Y

L E V E L - 1

	FILE #	REC #	TIME	TYPE	YEAR	DAY	LAT	LONG
STRT	1	1	194751	N	75	229	6753	-17263
STOP	1	1094	213007	N	75	229	5446	-17519
STRT	2	1	194640	S	75	229	6311	-16899
STOP	2	387	212936	S	75	229	5176	-17732
STRT	3	1	194821	R	75	229	6927	-17218
STOP	3	512	212920	R	75	229	5554	-15426
STRT	4	1	231543	N	75	229	4926	16281
STOP	4	662	1844	N	75	230	-6414	-2529
STRT	5	1	231440	S	75	229	4528	16170
STOP	5	233	1754	S	75	230	-6185	-348
STRT	6	1	231632	R	75	229	5222	16301
STOP	6	492	1750	R	75	230	-7365	-5149
STRT	7	1	22044	N	75	230	-2770	13581
STOP	7	1060	40539	N	75	230	-5555	11508
STRT	8	1	22520	S	75	230	-3227	13394
STOP	8	393	41040	S	75	230	-3697	10828
STRT	9	1	22733	R	75	230	-2600	13715
STOP	9	470	40550	R	75	230	-5174	13905
STRT	10	1	41136	N	75	230	-3598	11071
STOP	10	520	50042	N	75	230	4688	-5575
STRT	11	1	41128	S	75	230	-3634	10784
STOP	11	183	50000	S	75	230	4761	-5095
STRT	12	1	41225	R	75	230	-3428	11221
STOP	12	169	50008	R	75	230	5395	-7579

END OF INVENTORY

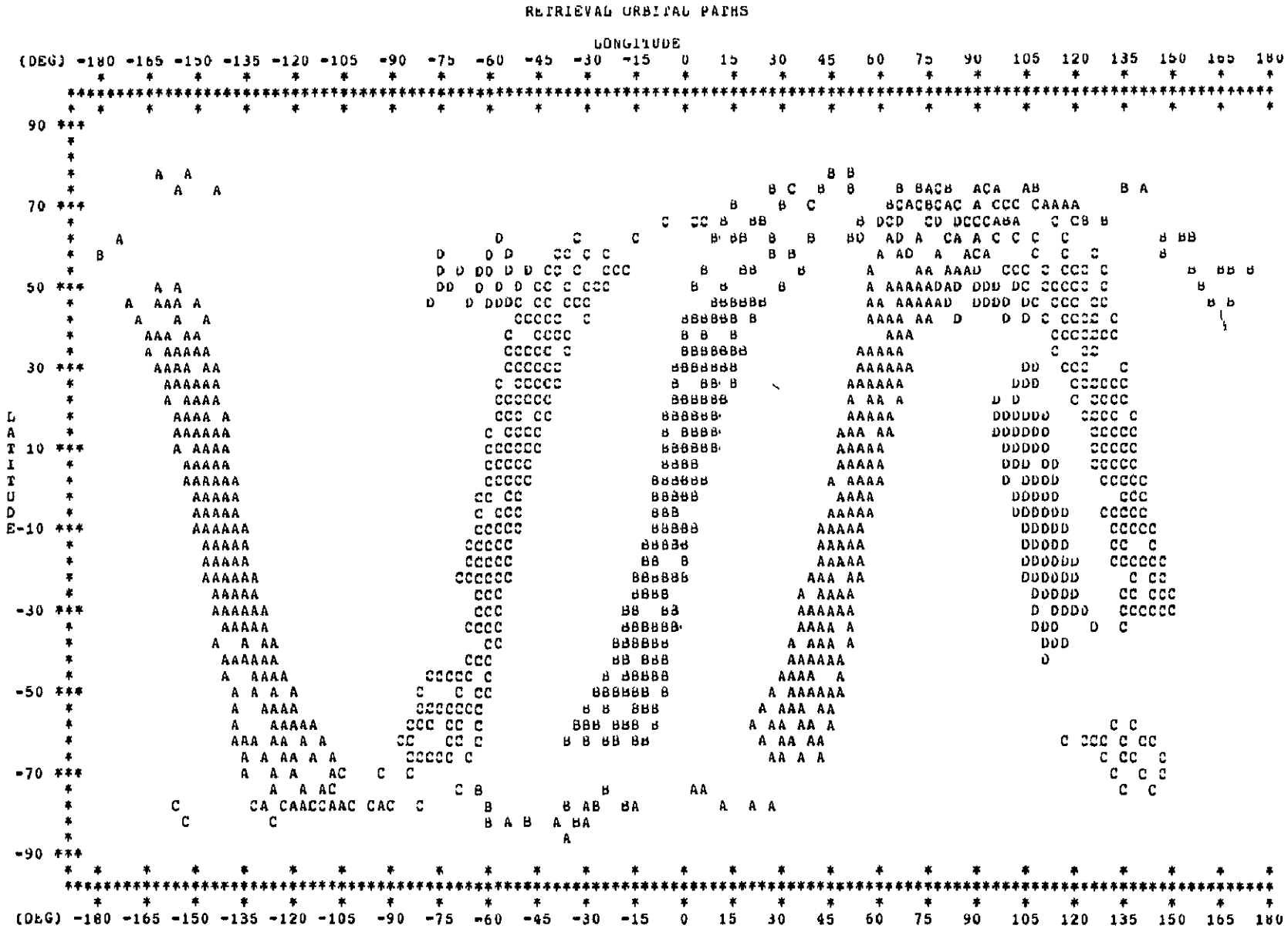


Figure 1. Sample Coverage on a Level I Data Tape

1. Conventional meteorological parameters (temperature, pressure, relative humidity, wind speed, and direction) from land stations, ships, remote stations, buoys, etc.
2. Sea surface temperature derived from ships and operational satellites.

The upper air file contains:

1. Conventional data from rawinsondes, pibals, and aircraft.
2. Operational satellite soundings.
3. Experimental Nimbus 6 high resolution vertical temperature and humidity profile soundings.
4. NESS operational wind vectors derived from satellite cloud motion pictures.
5. DST special high density, multi-level SMS cloud tracked wind reports derived by the University of Wisconsin.
6. DST special aircraft reports from arrangements made to collect wind and temperature data for commercial airline routes in the tropics.
7. Tropical Wind, Energy Conversion Reference Level Experiment (TWERLE) balloon reports from approximately 120 platforms in the tropical belt were collected. The reports provide 150 mb heights, and are available from August 18 through September 4, 1976.

Each tape is a 9-track, 1600 bits-per-inch (bpi), multifile, IBM S/360 standard label tape. There are 16 logical files on each tape. Each logical file is blocked such that each physical tape record is 5120 (8-bit) bytes in length.

Each logical file begins with a label record formatted according to the National Meteorological Center (NMC) Office Note 85 (July 1973) which identifies the file name, date, and nomial time (00, 06, 12, 18 UT) of the data set.

The data in each logical file represent 6-hourly collections, plus/minus 3 hours from the initial time specified in the label record, and are formatted according to NMC Office Note 29, Revision 2 (September 1973). A copy of the NMC Office Notes 29 and 85 may be obtained by contacting the author of this report.

Coverage maps showing the location all Level II data have been generated on 35 mm roll film by NMC and may be reviewed by contacting the author. Individual maps are available showing coverage of surface reports, radiosonde and VTPR data, Nimbus sounding data, NESS derived winds, University of Wisconsin derived winds, and TWERLE and special aircraft reports for each hemisphere for each 6 hour collection period for both DST-5 and DST-6. A representative sample of the Level II coverage maps for DST-6 are provided in Appendix

C as an example of the global coverage obtained from different elements of the DST observing systems. Summary counts of these data are provided in Table 3.

3.2.3 Level III Data

This data set contains global gridded analysis fields obtained from the Level II data described above. NMC generated the analyses at 00 and 12 UT for the periods covered by the DST-5 and DST-6 Level II data sets. During DST-5, NMC used the Flattery global (spectral) analysis method in a 12-hour update cycle. The first guess for each subsequent analysis was provided by a forecast from Stackpole's 9-layer primitive equation model operating on a 2.5 X 2.5 latitude/longitude grid. The same methods were used during DST-6, but with a six-hour update cycle.

The following parameters are available for each analysis cycle.

(1) East (u) and north (v) wind components, temperature, and height -- 12 mandatory pressure levels, 1000 to 50 mb

(2) relative humidity - 6 mandatory pressure levels, 1000 to 300 mb

(3) tropopause pressure (NMC model)

(4) sea surface temperature (NESS, 00 UT only)

Table 3

Summary Counts of DST-5 and DST-6 Level II Data

DST-5, Level II, 00 GMT, August 18 through 18 GMT, 4 September 1975

Totals, by Hemisphere (18 days)

N. H.		NIMBUS	VTPR	R/S	ACFT	TWRL	SATW	WISC	SFC	MISC
	00 GMT	11120	2488	13826	5492	4	4297	9475	71139	0
	06 GMT	9439	1641	4093	6862	12	1441	7956	69322	0
	12 GMT	12080	2077	14283	6219	209	2343	7104	72357	0
	18 GMT	10267	1810	5172	8441	22	3522	10643	70640	0
S. H.										
	00 GMT	9047	2883	2363	333	133	4492	8527	11077	0
	06 GMT	10783	3207	1022	899	228	2362	7717	10662	0
	12 GMT	11560	2790	3547	536	259	2027	5150	14090	0
	18 GMT	10284	3378	1044	451	296	4311	9173	12893	0

DST-6, Level II, 00 GMT, February 1 through 18 GMT, 4 March 1976

Totals, by hemisphere (33 days)

N. H.		NIMBUS	VTPR	R/S	ACFT	TWRL	SATW	WISC	SFC	MISC
	00 GMT	20773	4350	25349	9031	0	8916	16969	124425	11
	06 GMT	21656	3479	8272	11063	0	3585	13383	123698	0
	12 GMT	21765	4037	27319	8242	0	6174	14335	128041	19
	18 GMT	22165	3496	9770	10065	0	7208	14246	123871	20
S. H.										
	00 GMT	20736	5918	5066	2052	0	9397	16895	27877	0
	06 GMT	25654	6788	2453	2909	0	3516	14289	25909	0
	12 GMT	24212	6149	5289	2340	0	5768	14514	31991	0
	18 GMT	26182	6322	998	1722	0	6906	15360	29989	0

(5) surface temperature

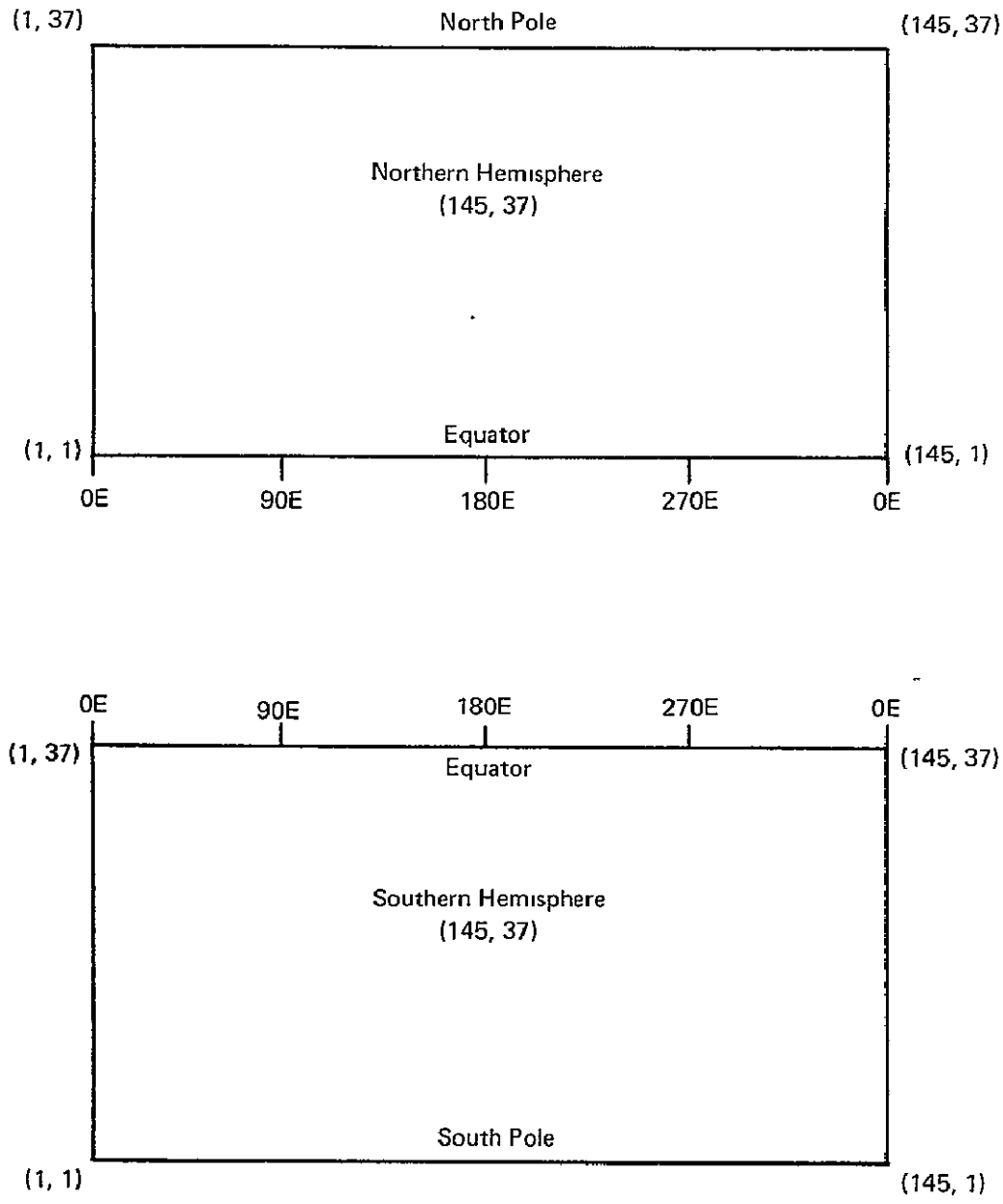
(6) snow field

The Level III tapes are 9-track, 1600 bpi, multifile, IBM S/360 standard label tapes. For DST-5, there are 9 day's data on each tape; for DST-6, there are 7 day's data on each tape. There are two logical files for each day containing the 00 and 12 UT analysis fields, respectively, for each day.

Each logical file begins with a label record formatted according to NMC Office Note 85 (July 1973) which identifies the file name, date, and nominal time (00 or 12 UT) of the data set. The data in each logical file are recorded as 10,780 byte records and are formatted according to NMC Office Note 84. A copy of the NMC Office Notes 84 and 85 is available from the author.

The logical index arrangement of the intra-record format of the Level III data is diagrammatically presented in Figure 2.

Contour plots of each of the analyzed fields have been prepared by NMC on 35 mm film rolls and may be reviewed by contacting the author. A representative sample of the Level III analyses is shown in Appendix D.



2 5 x 2 5 Degrees Latitude/Longitude Grids

Figure 2. Index Arrangement of Level III Data

4. DATA RETRIEVAL SYSTEM

The DRS was designed to facilitate interactive user access to specific data items of interest and to aid in the preparation and output of selected data for further research studies.

4.1 Hardware System Utilization

The DRS is implemented on the Applications Directorate's AOIPS described by Bracken et al in Reference 3. At present, the DRS utilizes only a very limited subset of the total hardware system resources contained within the AOIPS and a very simplistic configuration overview of these DRS utilized features is shown in Figure 3. A Digital Equipment Corporation (DEC) PDP-11/70 is the host processor for the DRS. A DEC model VT52 or an equivalent alphanumeric keyboard with a CRT display serves as the primary unit through which a local user may interactively select the menu guided processing options of the DRS. Either the CRT (80 columns) or a standard line printer (132 columns) may be user selected as the DRS "print" device permitting temporary or hard copy output of data selected for review. A magnetic tape recorder unit (1600 bpi) serves as the primary device for inputting the GARP data sets for user inventory or subsequent subset data set creation; however, output data sets may be produced as either 800 or 1600 bpi magnetic tapes. Permanent on line disk

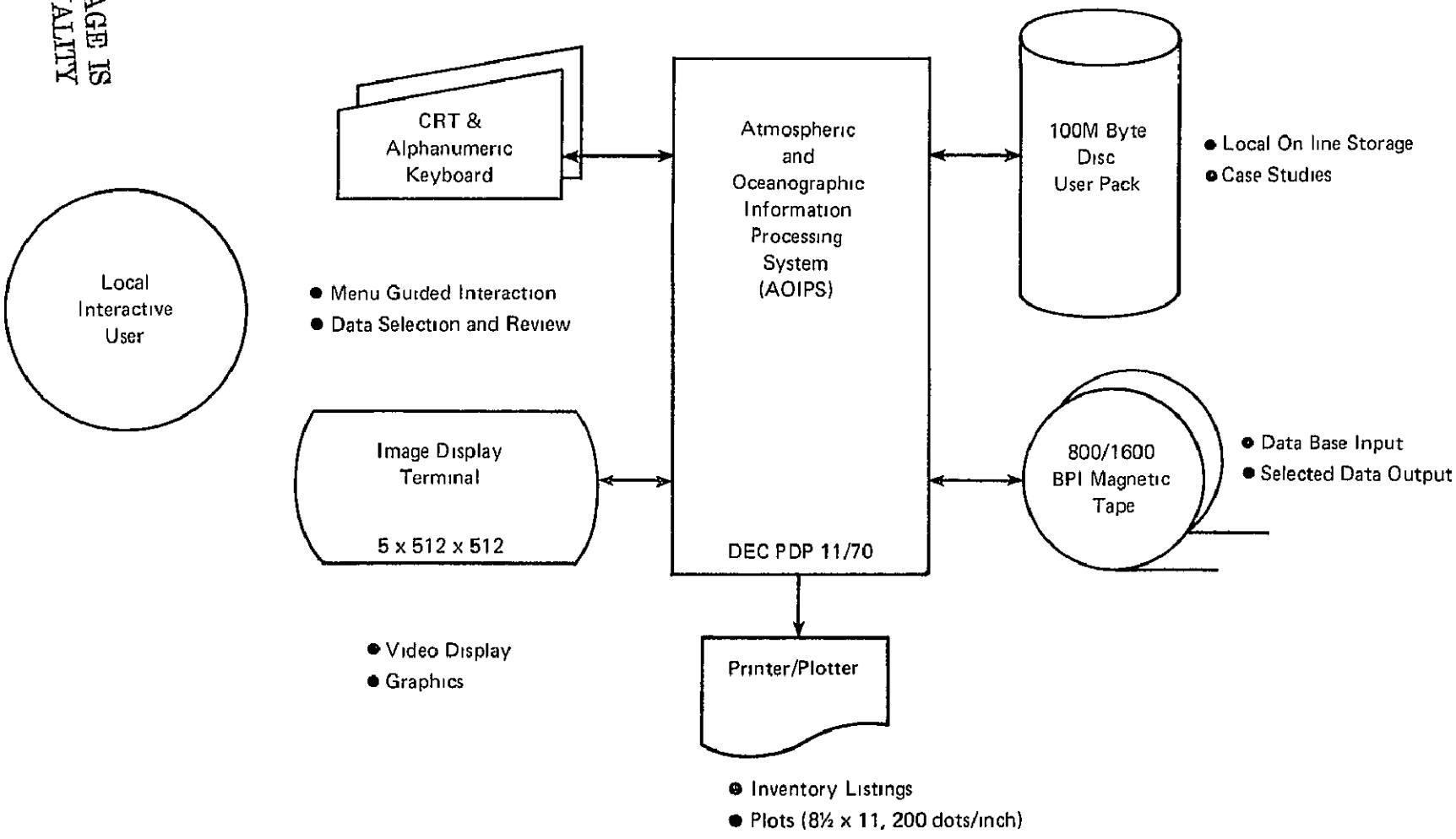


Figure 3. Data Retrieval System Configuration Overview

storage is utilized for DRS program development, operational task or object module residence, DRS controlled data files for restart recovery, and user defined data files for special case study data sets. The hard copy plotting and the image display terminal capabilities of AOIPS are features which the DRS plans to but has not yet included in its user support. These capabilities should be available by mid-1978.

4.2 Software System Support

The software system of the DRS was designed to support a broad variety of user interactively selected functions enabling an investigator who is interested in some subset of the total data base to read, reformat, copy, or display selected portions of the data sets. Towards this end, four major processing functions have been built into the DRS programs. The major functions are: 1) an inventory process whereby pertinent, pre-defined data identification information is extracted from the contents of an input tape or disk resident data set and is displayed or hard copy printed for user review thereby permitting the user to validate that he is working with a data set in which he is interested, 2) a capability by which a user may create from a large input data set a smaller output data subset containing only data that falls within a user defined time window and latitude/longitude boundary, 3) an individual data item selection capability whereby only user

specified data information types from within the user bounded area are saved as data sets for follow on display or research purposes, and 4) an image display capability by which user specified data set types are transformed into digital imagery data and may be displayed on image display terminals. A summary diagram showing these major functional capabilities of the DRS is shown in Figure 4.

The software constructed to support these functions has been designed with the principle of a general data base management system while implementation has been tailored to meet the requirements of handling the GARP data sets. In particular, there is a data definition language which permits users to identify data level type, data file information type, and individual data item types. A syntax module deciphers user specified, data definition language requests, checks for illegal entries, and compiles internal index tables which are used by I/O modules knowledgable about the physical data formats to perform the selected data retrieval accesses. Detailed knowledge of data formats by the user is not required. In fact, the entire user interface with the system is in the form of very simple "key-ins" in response to prompts following display message outputs or "menus" describing the user selectable options available. An example of such a menu is the DRS Main Menu shown in Figure 5. This menu displays the

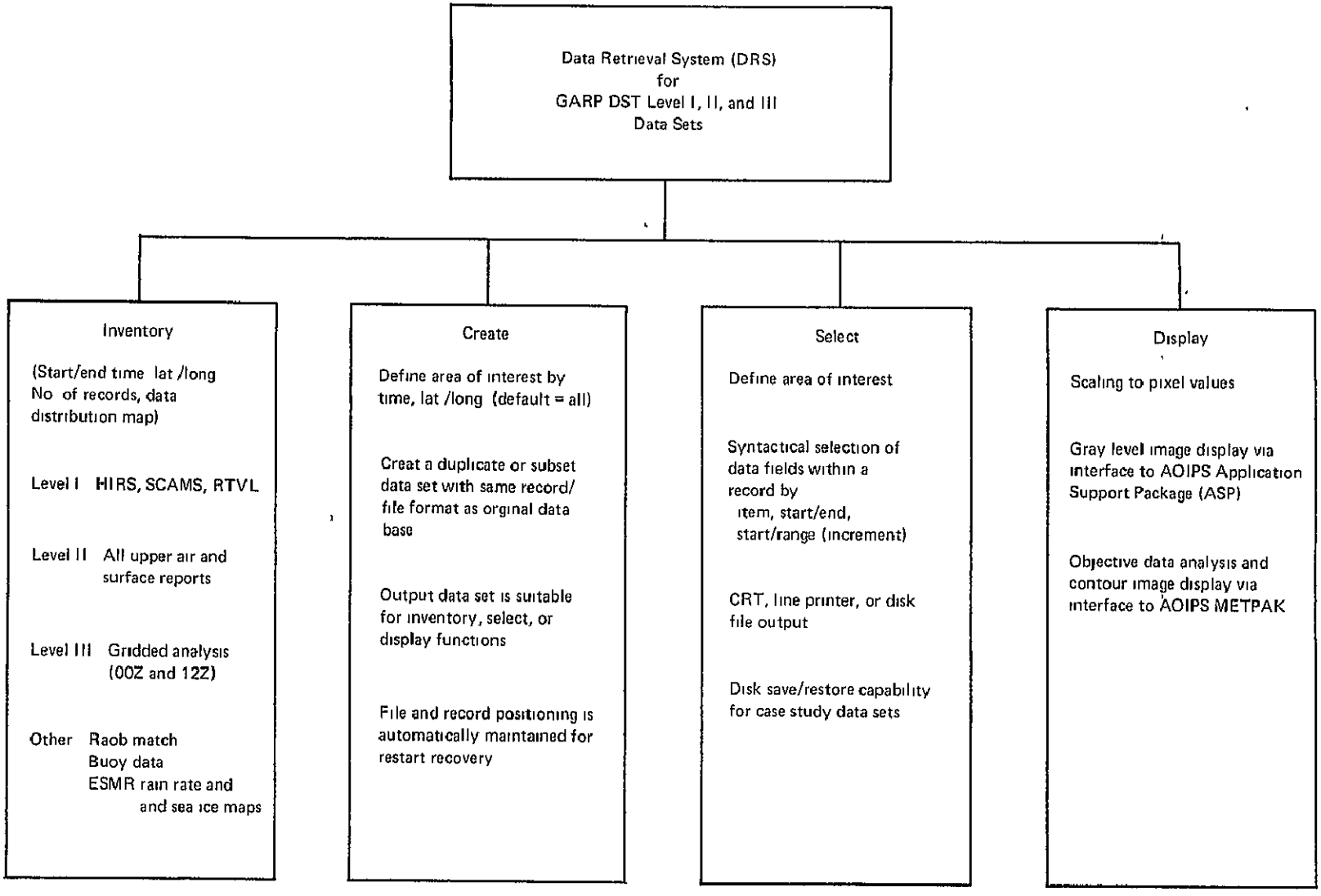


Figure 4 Major Functional Capabilities of AOIPS DRS

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                    **  DRS MAIN MENU  **

C.R.  . . . . . . . . . . . . . . . . . DISPLAY MAIN MENU

1     . . . . . . . . . . . . . . . . . EXIT

2     . . . . . . . . . . . . . . . . . I/O DEVICE RECONFIGURATION

3     . . . . . . . . . . . . . . . . . RESTART RECOVERY

4,N   . . . . . . . . . . . . . . . . . INVENTORY DATA BASE (LEVEL N)

5,N   . . . . . . . . . . . . . . . . . CREATE SUBSET DATA SET (LEVEL N)

6,N   . . . . . . . . . . . . . . . . . SELECT DATA ITEMS (LEVEL N)

7,N   . . . . . . . . . . . . . . . . . DISPLAY DATA IMAGERY (LEVEL N)


ENTER REQUEST:
```

Figure 5. Example of a DRS Menu

user options of: 1) exiting the DRS, 2) reassigning the hardware devices used for inputting and outputting data sets or for displaying and printing of data item values, 3) re-starting a previously terminated DRS run, or 4) - 7) performing one of the four major DRS functions on an input Level I, II, or III data set. Except for EXIT which terminates a DRS run, selection of any option will cause a sequence of new menus to be displayed from which the user may select appropriate suboptions. After the eventual execution of the user selected function, program control will return to redisplay the main menu.

A complete and thorough discussion of all of the DRS menus and user options is contained in Reference 4. However, some further descriptive information of some of the key DRS features is contained in the following sections.

4.2.1 Inventory

A sample output of a Level I data set inventory is shown in Section 3.2.1. Information displayed to the user includes the time and latitude/longitude of the first and last record in each file from an input data set. The coverage map of the retrieved sounding data (see Figure 1) clearly shows the multi-orbit content of the input data set.

Sample outputs showing the spatial and temporal data distribution of an upper air file from a Level II data set inventory are shown in Figures 6 and 7; a Level III data set inventory is shown in Figure 8.

4.2.2 Create

The create function permits a user to build a data set that contains only data that falls within a user specified time and latitude/longitude boundary. Use of this function is illustrated by the example of the researcher who is interested in a case study of a limited polar area over a multi-day period. The required data is originally spread over a large number of archived data tapes. One multi-tape pass through the create module may create a single tape or disk resident data set that is more easily managed. An important aspect of the created output data set is that it will be in formats that are suitable for inventory or data item selection. Another important feature is that, through the use of the automatic restart recovery feature, one multi-tape pass need not be completed in a single run or user session but may instead be spread over several days if desired.

FILE: 1 NUMBER OF REPORTS: 3248

OBSERVATION TIME: 0000 GMT 8/18/75 JULIAN DAY 230

OBSERVATION TYPE: UPPER AIR

WORLD DISTRIBUTION: NUMBER OF OBSERVATIONS PER 10 DEG LAT. BY 20 DEG LONG. GRID

	-180	-160	-140	-120	-100	-80	-60	-40	-20	0	20	40	60	80	100	120	140	160	180
90	0	0	0	0	0	2	4	1	0	0	0	0	1	1	1	0	0	1	
80	1	3	6	7	13	13	2	4	4	2	1	0	2	3	2	1	2	0	
70	9	8	7	15	5	7	6	13	10	2	10	8	4	5	2	4	3	8	
60	19	11	19	23	10	6	10	26	23	13	19	24	19	7	12	13	10	14	
50	8	17	28	28	20	14	11	25	34	11	20	29	33	26	21	12	13	8	
40	8	14	44	52	18	15	8	10	24	16	20	52	36	42	26	31	43	3	
30	10	5	30	40	8	17	1	3	23	7	10	25	25	37	18	15	59	14	
20	3	10	25	18	6	9	0	0	12	19	6	21	33	36	35	29	23	2	
10	5	10	19	19	3	3	0	2	11	18	4	3	9	47	44	34	20	0	
0	7	18	19	17	2	1	0	2	6	19	10	8	29	37	33	34	17	2	
-10	4	17	9	4	5	0	6	3	2	19	18	12	16	45	47	45	17	2	
-20	3	16	4	4	7	0	1	2	5	20	22	20	6	39	47	40	9	2	
-30	9	14	6	5	4	2	0	1	5	24	9	7	3	18	1	21	2	0	
-40	7	3	4	5	4	3	0	1	5	15	7	5	3	4	2	7	1	1	
-50	1	2	2	2	3	5	0	0	1	11	9	1	5	1	0	0	0	0	
-60	0	1	1	2	1	3	2	1	1	4	3	2	2	0	0	0	0	0	
-70	1	0	0	1	0	0	0	0	0	1	2	3	0	0	0	0	0	0	
-80	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
-90																			

Figure 6. Example Level II Spatial Distribution Inventory

OBSERVATION TIME DISTRIBUTION

DEPARTURE FROM STANDARD SYNOPTIC TIME (HOURS)

	-3	-2	-1	0	+1	+2	+3	TOTALS
LAND STATIONS	0	0	0	922	0	0	0	922
OCEAN STATIONS	0	0	0	3	0	0	0	3
AIRCRAFT & PIREP	1	10	15	11	69	72	50	228
SATELLITE SOUNDINGS	232	57	250	105	32	28	215	919
SATELLITE WINDS	0	475	0	0	0	0	701	1176
ALL UPPER AIR	233	542	265	1041	101	100	966	3248

NUMBER OF MONITORING BOGUS REPORTS: 0

Figure 7. Example Level II Temporal Distribution Inventory

L E V E L - 3 F I L E S U M M A R Y

THE FOLLOWING PARAMETERS ARE AVAILABLE FOR EACH ANALYSIS CYCLE:
U,V,T,Z---12 MANDATORY PRESSURE LEVELS, 1000MB TO 50MB
REL. HUMIDITY---6 MANDATORY PRESSURE LEVELS, 1000MB TO 300MB
TROPOPAUSE PRESSURE (NMC MODEL)
SEA SURFACE TEMPERATURE (NESS, 0000 GMT ONLY)
SURFACE TEMPERATURE
SNOW FIELD

FILE NO.	DATE & TIME	JULIAN DAY
1	8/18/75 0 GMT	230
2	8/18/75 12 GMT	230
3	8/19/75 0 GMT	231
4	8/19/75 12 GMT	231
5	8/20/75 0 GMT	232
6	8/20/75 12 GMT	232
7	8/21/75 0 GMT	233
8	8/21/75 12 GMT	233
9	8/22/75 0 GMT	234
10	8/22/75 12 GMT	234
11	8/23/75 0 GMT	235
12	8/23/75 12 GMT	235
13	8/24/75 0 GMT	236
14	8/24/75 12 GMT	236
15	8/25/75 0 GMT	237
16	8/25/75 12 GMT	237

Figure 8. Example Level III Inventory

4.2.3 Select

The select function allows the user to selectively identify, save, and/or display only certain types of data contained within a user defined temporal and spatial boundary. Hence, for example, even though the HIRS instrument sampled radiances in 17 different channel frequencies, the user may select only the data from the 13th channel for a particular study.

The select function has been designed syntactically and permits user selection by individual data items or by a start/end range of data items with an optional increment feature. Users may compile a completely new list of data selection items or may edit a previously defined list of data identifiers used for an earlier study. All user entries are checked for validity.

The user menu for the selection function is shown in Figure 9. Key auxillary features supported in this menu (and in the create function menu) include an INPUT HISTORY which may be utilized by the user to review what he has input so far and a HELP DESCRIPTIONS which displays more textual information further describing the use of any select (or create) option. User selection of options 8 or 9 permits user definition or editing of the data identification and selection criteria.

```
                SYNTAX MENU

<CR>  ..............................  PRINT MENU OPTIONS
 1    ..............................  INPUT COMPLETED
 2    ..............................  ABORT RETURN
 3    ..............................  INPUT HISTORY
 4    ..............................  HELP DESCRIPTIONS
 5,DDD,HH,MM,SS,DDD,HH,MM,SS .....  TIME RANGE (DDD=DAYS 1-366)
       (UPPER)   (LOWER)      (HH=HOURS 0-23)      (MM=MINUTES 0-59)
                             (SS=SECONDS 0-59)
 6,XXXX,YYYY  .....................  LATITUDE RANGE (XXXX=LOWER -90 TO 90)
                                                    (YYYY=UPPER -90 TO 90)
 7,XXXX,YYYY  .....................  LONGITUDE RANGE(XXXX=LOWER -180 TO 180)
                                                    (YYYY=UPPER -180 TO 180)
 8,N,XXXX,YYYY,ZZZZ ...............  SELECT DATA(N=FILE TYPE WHERE:
                                 HIRS=1;SCAM=2;RIVL=3)   (XXXX=LOWER ITEM)
                                 (YYYY=UPPER ITEM)     (ZZZZ=INCREMENT NO.(OPTION))
 9,N,LL,XXXX,YYYY,ZZZZ  ...........  DELETE/CHANGE SELECT DATA (N=FILE
                                 TYPE WHERE: ALL FILES=0;  HIRS=1;SCAM=2;RIVL=3)
                                 (LL=SEQUENCIALLY ENTRY NUMBER FROM INPUT
                                  HISTORY LIST)  (LL=0 DELETES REQ. FILE'S DATA)
                                 (XXXX,YYYY,ZZZZ=SELECT DATA CHANGE INPUT WHERE:
                                 XXXX=LOWER ITEM;YYYY=UPPER ITEM;ZZZZ=INCREMENT)
ENTER REQUEST (<CR> FOR MENU):
```

Figure 9. DRS Select Menu

Output data sets created by the select function are stored and accessed by DRS disk data base management modules. A data directory is constructed and maintained containing indexed data identification numbers as location pointers to where the actual data values are stored. The actual values of the selected data are stored on line in a disk dependent format to optimize storage and access considerations. The data structures and formats designed to manage the disk resident data base are contained in Appendix E.

The disk resident selected data and its directory may be displayed, printed, or stored on save tapes for follow on analyses. The save tapes data may be output in DEC or IBM formatted integer and floating point quantities. Saved tapes may furthermore be "rebooted" to disk and will include the automatic loading of the data directory.

4.2.4 Display

The image display functions of the DRS have not yet been fully designed but will attempt to link to or make maximum utilization of routines written as part of the AOIPS Support Package (ASP) and METPAK systems described in Reference 3.

4.3 Software Documentation

In addition to the above referenced DRS Users Guide, a complete program design and programmer's manual (Reference 5) has been prepared describing all pertinent aspects of the multi-tasked, overlaid DRS program modules.

5. FUTURE ENHANCEMENTS

As mentioned in the Introduction, the data base management system described in this report will be utilized to support data requests of both in-house researchers and investigators funded under an Announcement of Opportunity. Based upon new data access requirements of these data users, new information retrieval and display capabilities will be added to the presently implemented functions of the DRS. Currently recognized features include the capability to permit interactive user definition of output formats for data sets to be utilized in non-DRS programs and the capability to create data sets in formats suitable for display on the AOIPS interactive image display terminals. Efforts are already in progress to interface selected data items from the GARP data sets to the Cressman and Lackman objective analysis schemes of the AOIPS METPAK system and to perform a nearest neighbor resampling registration of zenith angle corrected SCAMS radiance data to HIRS radiance data. Implementation of these latter functions are expected to be completed within 2 months. The other recognized features will be completed on a priority basis.

ACKNOWLEDGEMENTS

The author wishes to acknowledge the valuable design and programming implementation contributions of Mr. Robert Krajewski, Ms. Lindsay Grace, and Mr. Paul Carpenter, all of Computer Sciences Corporation.

The support of Messrs. Harry Press and James Greaves of the GARP Project is also acknowledged for their monetary support.

Finally, I would like to thank Ms. Colleen Baranek who never complained even once during the interpreting and typing of my hand written draft material.

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2. GARP Project Office, GARP Project Report on May 1974 Data Systems Test, NASA/GSFC, November 1974.

3. Bracken, P. A., Dalton, J. T., Billingsley, J. B., and Quann, J. J., Atmospheric and Oceanographic Information Processing System (AOIPS) System Description, NASA/GSFC, X-933-77-148, March 1977.

4. Computer Sciences Corporation, Atmospheric and Oceanographic Information Processing System (AOIPS) Data Retrieval System Users Guide, Silver Spring, Maryland, October 1977.

5. Computer Sciences Corporation, Data Retrieval System (DRS) Design and Programmers Manual, Silver Spring, Maryland, October 1977.

GLOSSARY

AOIPS	Atmospheric and Oceanographic Information Processing System
CRT	Cathode Ray Tube
DEC	Digital Equipment Corporation
DRS	Data Retrieval System
DST	Data Systems Test
FGGE	First GARP Global Experiment
GARP	Global Atmospheric Research Program
HIRS	High Resolution Infrared Radiometer Sounder
ITOS	Improved TIROS
NESS	National Environmental Satellite Service
NMC	National Meteorological Center
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
SCAMS	Scanning Microwave Spectrometer
SMS/GOES	Synchronous Meteorological Satellite/Geostationary Operational Environmental Satellite
TWERLE	Tropical Wind, Energy Conversion Reference Level Experiment
UT	Universal Time (hours)
VTPR	Vertical Temperature Profile Radiometer

Appendix A.

GARP DST Data Tape Archive

GARP DST Data Tape Archive

Tape Slot Number	Original Tape Number	Level Number	Beginning Date & Time	Ending Date & Time	Year	Number of Files	Notes
GARP001	DAB511	2	18/Aug. (00Z)	19/Aug. (18Z)	75	16	
GARP002	DAB512	2	20/Aug (00Z)	21/Aug. (18Z)	75	16	
GARP003	DAB521	2	22/Aug (00Z)	23/Aug. (18Z)	75	16	
GARP004	DAB522	2	24/Aug. (00Z)	25/Aug. (18Z)	75	16	
GARP005	DAB523	2	26/Aug. (00Z)	27/Aug. (18Z)	75	16	
GARP006	DAB524	2	28/Aug. (00Z)	29/Aug. (18Z)	75	16	
GARP007	DAB525	2	30/Aug. (00Z)	31/Aug. (18Z)	75	16	
GARP008	DAB527	2	1/Sep. (00Z)	2/Sep. (18Z)	75	16	
GARP009	DAB529	2	3/Sep. (00Z)	4/Sep. (18Z)	75	16	
GARP010	DAB552	3	18/Aug. (00Z)	25/Aug. (12Z)	75	16	
GARP011	DAB553	3	26/Aug. (00Z)	4/Sep. (12Z)	75	20	
GARP012	CAROL1	1	24/Aug. (00Z)	28/Aug. (23Z)	75	30	1
GARP013	CAROL2	1	29/Aug. (00Z)	4/Sep. (23Z)	75	26	1
GARP014	DS5MAT	-	18/Aug. (00Z)	4/Sep. (18Z)	75	72	2
GARP015	DORIS1	1	28/Aug. (00Z)	30/Aug. (23Z)	75	18	3
GARP016	DORIS2	1	31/Aug. (00Z)	2/Sep. (23Z)	75	18	3
GARP017	DORIS3	1	3/Sep. (00Z)	4/Sep. (23Z)	75	12	3
GARP018	DS6MAT	-	1/Feb. (00Z)	21/Feb. (6Z)	76	81	2
GARP019	DS6MAT	-	1/Feb. (00Z)	21/Feb. (6Z)	76	81	2
GARP020	DAB511	2	18/Aug. (00Z)	19/Aug. (18Z)	75	16	
GARP021	DAB512	2	20/Aug. (00Z)	21/Aug. (18Z)	75	16	
GARP022	DAB521	2	22/Aug. (00Z)	23/Aug. (18Z)	75	16	
GARP023	DAB522	2	24/Aug. (00Z)	25/Aug. (18Z)	75	16	
GARP024	DAB523	2	26/Aug. (00Z)	27/Aug. (18Z)	75	16	
GARP025	DAB524	2	28/Aug. (00Z)	29/Aug. (18Z)	75	16	
GARP026	DAB525	2	30/Aug. (00Z)	31/Aug. (18Z)	75	16	
GARP027	DAB527	2	1/Sep. (00Z)	2/Sep. (18Z)	75	16	
GARP028	DAB529	2	3/Sep. (00Z)	4/Sep. (18Z)	75	16	
GARP029	DAB552	3	18/Aug. (00Z)	25/Aug. (12Z)	75	16	
GARP030	DAB553	3	26/Aug. (00Z)	4/Sep. (12Z)	75	20	
GARP031	CAROL1	1	24/Aug. (00Z)	28/Aug. (23Z)	75	30	1
GARP032	CAROL2	1	29/Aug. (00Z)	4/Sep. (23Z)	75	26	1
GARP033	DS5MAT	-	18/Aug. (00Z)	4/Sep. (18Z)	75	72	2

GARP DST Data Tape Archive

Tape Slot Number	Original Tape Number	Level Number	Beginning Date & Time	Ending Date & Time	Year	Number of Files	Notes
GARP034	DORIS1	1	23/Aug. (00Z)	30/Aug. (23Z)	75	18	3
GARP035	DORIS2	1	31/Aug. (00Z)	2/Sep. (23Z)	75	18	3
GARP036	DORIS3	1	3/Sep. (00Z)	4/Sep. (23Z)	75	12	3
GARP037	DAB29A	2	2/May (00Z)	2/May (18Z)	74	8	
GARP038	DAB34A	2	3/May (00Z)	3/May (18Z)	74	8	
GARP039	DAB39A	2	4/May (00Z)	4/May (18Z)	74	8	
GARP040	DAB44A	2	5/May (00Z)	5/May (18Z)	74	8	
GARP041	DAB49A	2	6/May (00Z)	6/May (18Z)	74	8	
GARP042	DAB54A	2	7/May (00Z)	7/May (18Z)	74	8	
GARP043	DAB59A	2	8/May (00Z)	8/May (18Z)	74	8	
GARP044	DAB64A	2	9/May (00Z)	9/May (18Z)	74	8	
GARP045	DAB69A	2	10/May (00Z)	10/May (18Z)	74	8	
GARP046	DAB74A	2	11/May (00Z)	11/May (18Z)	74	8	
GARP047	DAB79A	2	12/May (00Z)	12/May (18Z)	74	8	
GARP048	DAB84A	2	13/May (00Z)	13/May (18Z)	74	8	
GARP049	DAB89A	2	14/May (00Z)	14/May (18Z)	74	8	
GARP050	DAB94A	2	15/May (00Z)	15/May (18Z)	74	8	
GARP051	DAB99A	2	16/May (00Z)	16/May (18Z)	74	8	
GARP052	DAB04B	2	17/May (00Z)	17/May (18Z)	74	8	
GARP053	DAB09B	2	18/May (00Z)	18/May (18Z)	74	8	
GARP054	DAB14B	2	19/May (00Z)	19/May (18Z)	74	8	
GARP055	DAB19B	2	20/May (00Z)	20/May (18Z)	74	8	
GARP056	DAB24B	2	21/May (00Z)	21/May (18Z)	74	8	
GARP057	DAB29B	2	22/May (00Z)	22/May (18Z)	74	8	
GARP058	DAB34B	2	23/May (00Z)	23/May (18Z)	74	8	
GARP059	DAB39B	2	24/May (00Z)	24/May (18Z)	74	8	
GARP060	DAB44B	2	25/May (00Z)	25/May (18Z)	74	8	
GARP061	DAB49B	2	26/May (00Z)	26/May (18Z)	74	8	
GARP062	DAB54B	2	27/May (00Z)	27/May (18Z)	74	8	
GARP063	DAB59B	2	28/May (00Z)	28/May (18Z)	74	8	
GARP064	DAB64B	2	29/May (00Z)	29/May (18Z)	74	8	
GARP065	DAB69B	2	30/May (00Z)	30/May (18Z)	74	8	

GARP DST Data Tape Archive

Tape Slot Number	Original Tape Number	Level Number	Beginning Date & Time	Ending Date & Time	Year	Number of Files	Notes
GARP066	DAB09C	3	4/May (00Z)	6/May (12Z)	74	6	
GARP067	DAB14C	3	7/May (00Z)	9/May (12Z)	74	6	
GARP068	DAB19C	3	10/May (00Z)	12/May (12Z)	74	6	
GARP069	DAB24C	3	13/May (00Z)	15/May (12Z)	74	6	
GARP070	DAB29C	3	16/May (00Z)	18/May (12Z)	74	6	
GARP071	DAB34C	3	19/May (00Z)	21/May (12Z)	74	6	
GARP072	DAB39C	3	22/May (00Z)	24/May (12Z)	74	6	
GARP073	DAB44C	3	25/May (00Z)	27/May (12Z)	74	6	
GARP074	DAB49C	3	28/May (00Z)	30/May (12Z)	74	6	
GARP075	DS6001	1	31/Jan.(17Z)	1/Feb. (04Z)	76	19	
GARP076	DS6002	1	01/Feb. (04Z)	01/Feb. (14Z)	76	19	
GARP077	DS6003	1	01/Feb. (21Z)	02/Feb. (07Z)	76	19	
GARP078	DS6004	1	02/Feb. (08Z)	02/Feb. (17Z)	76	19	
GARP079	DS6004	1	02/Feb. (17Z)	03/Feb. (11Z)	76	19	
GARP080	DS6006	1	03/Feb. (02Z)	03/Feb. (13Z)	76	19	
GARP081	DS6007	1	03/Feb. (08Z)	03/Feb. (16Z)	76	19	
GARP082	DS6008	1	03/Feb (11Z)	03/Feb. (22Z)	76	19	
GARP083	DS6009	1	04/Feb. (00Z)	04/Feb. (05Z)	76	19	
GARP084	DS6010	1	04/Feb. (05Z)	04/Feb. (12Z)	76	19	
GARP085	DS6011	1	04/Feb. (12Z)	04/Feb. (19Z)	76	19	
GARP086	DS6012	1	04/Feb. (20Z)	05/Feb (06Z)	76	19	
GARP087	DS6013	1	05/Feb. (06Z)	05/Feb (13Z)	76	19	
GARP088	DS6014	1	05/Feb. (13Z)	05/Feb (21Z)	76	19	
GARP089	DS6015	1	05/Feb. (22Z)	06/Feb (03Z)	76	19	
GARP090	DS6016	1	06/Feb. (03Z)	06/Feb (09Z)	76	19	
GARP091	DS6017	1	06/Feb (11Z)	06/Feb (18Z)	76	19	
GARP092	DS6018	1	06/Feb. (18Z)	07/Feb. (07Z)	76	19	
GARP093	DS6019	1	07/Feb. (08Z)	07/Feb. (15Z)	76	19	
GARP094	DS6020	1	08/Feb (08Z)	08/Feb. (13Z)	76	19	
GARP095	DS6021	1	08/Feb. (13Z)	08/Feb. (20Z)	76	19	
GARP096	DS6022	1	08/Feb (20Z)	09/Feb (05Z)	76	19	
GARP097	DS6023	1	09/Feb. (05Z)	09/Feb (12Z)	76	19	

GARP DST Data Tape Archive

Tape Slot Number	Original Tape Number	Level Number	Beginning Date & Time	Ending Date & Time	Year	Number of Files	Notes
GARP098	DS6024	1	09/Feb. (12Z)	09/Feb. (19Z)	76	19	
GARP099	DS6025	1	09/Feb. (19Z)	10/Feb. (02Z)	76	19	
GARP100	DS6026	1	10/Feb. (02Z)	10/Feb. (08Z)	76	19	
GARP101	DS6027	1	10/Feb. (08Z)	10/Feb. (15Z)	76	19	
GARP102	DS6028	1	10/Feb. (15Z)	10/Feb. (22Z)	76	19	
GARP103	DS6029	1	10/Feb. (22Z)	11/Feb. (04Z)	76	19	
GARP104	DS6030	1	11/Feb. (04Z)	11/Feb. (11Z)	76	19	
GARP105	DS6031	1	11/Feb. (11Z)	11/Feb. (18Z)	76	19	
GARP106	DS6032	1	11/Feb. (18Z)	12/Feb. (00Z)	76	19	
GARP107	DS6033	1	12/Feb. (00Z)	12/Feb. (08Z)	76	19	
GARP108	DS6034	1	12/Feb. (08Z)	12/Feb. (15Z)	76	19	
GARP109	DS6035	1	12/Feb. (16Z)	12/Feb. (22Z)	76	19	
GARP110	DS6036	1	13/Feb. (00Z)	13/Feb. (06Z)	76	19	
GARP111	DS6037	1	13/Feb. (06Z)	13/Feb. (13Z)	76	19	
GARP112	DS6038	1	13/Feb. (23Z)	14/Feb. (05Z)	76	19	
GARP113	DS6039	1	14/Feb. (05Z)	14/Feb. (09Z)	76	13	
GARP114	DS6040	1	14/Feb. (12Z)	14/Feb. (19Z)	76	19	
GARP115	DS6041	1	14/Feb. (19Z)	15/Feb. (02Z)	76	19	
GARP116	DS6042	1	15/Feb. (02Z)	15/Feb. (08Z)	76	19	
GARP117	DS6043	1	15/Feb. (08Z)	15/Feb. (15Z)	76	19	
GARP118	DS6044	1	15/Feb. (15Z)	15/Feb. (22Z)	76	19	
GARP119	DS6045	1	15/Feb. (22Z)	16/Feb. (04Z)	76	19	
GARP120	DS6045	1	16/Feb. (04Z)	16/Feb. (13Z)	76	19	
GARP121	DS6047	1	16/Feb. (13Z)	16/Feb. (20Z)	76	19	
GARP122	DS6048	1	16/Feb. (11Z)	17/Feb. (00Z)	76	19	
GARP123	DS6049	1	17/Feb. (00Z)	17/Feb. (07Z)	76	19	
GARP124	DS6050	1	17/Feb. (07Z)	17/Feb. (14Z)	76	19	
GARP125	DS6051	1	17/Feb. (14Z)	17/Feb. (23Z)	76	19	
GARP126	DS6052	1	17/Feb. (22Z)	18/Feb. (04Z)	76	19	
GARP127	DS6053	1	18/Feb. (04Z)	18/Feb. (11Z)	76	19	
GARP128	DS6054	1	18/Feb. (11Z)	18/Feb. (22Z)	76	19	
GARP129	DS6055	1	18/Feb. (22Z)	19/Feb. (04Z)	76	19	
GARP130	DS6056	1	19/Feb. (04Z)	19/Feb. (11Z)	76	19	
GARP131	DS6057	1	19/Feb. (11Z)	19/Feb. (18Z)	76	19	

GARP DST Data Tape Archive

Tape Slot Number	Tape Number	Level Number	Beginning Date & Time	Ending Date & Time	Year	Number of Files	Notes
GARP132	DS6058	1	19/Feb (14Z)	19/Feb. (21Z)	76	19	
GARP133	DS6059	1	19/Feb. (21Z)	20/Feb. (05Z)	76	19	
GARP134	DS6060	1	20/Feb. (05Z)	20/Feb (13Z)	76	19	
GARP135	DS6061	1	19/Feb (18Z)	20/Feb. (15Z)	76	19	
GARP136	DS6062	1	20/Feb. (15Z)	20/Feb. (23Z)	76	19	
GARP137	DS6063	1	20/Feb. (17Z)	21/Feb. (13Z)	76	19	
GARP138	DS6064	1	21/Feb. (01Z)	21/Feb. (07Z)	76	19	
GARP139	DS5001	1	17/Aug. (19Z)	18/Aug. (05Z)	75	19	
GARP140	DS5002	1	18/Aug. (06Z)	18/Aug. (15Z)	75	19	
GARP141	DS5003	1	18/Aug. (15Z)	18/Aug. (22Z)	75	19	
GARP142	DS5004	1	18/Aug. (18Z)	18/Aug (23Z)	75	10	
GARP143	DS5005	1	19/Aug. (04Z)	19/Aug (13Z)	75	19	
GARP144	DS5006	1	19/Aug. (13Z)	19/Aug (20Z)	75	19	
GARP145	DS5007	1	20/Aug. (05Z)	20/Aug. (12Z)	75	19	
GARP146	DS5008	1	20/Aug (14Z)	20/Aug. (22Z)	75	19	
GARP147	DS5009	1	20/Aug. (21Z)	21/Aug. (03Z)	75	19	
GARP148	DS5010	1	21/Aug. (03Z)	21/Aug. (09Z)	75	19	
GARP149	DS5011	1	21/Aug. (09Z)	21/Aug. (18Z)	75	19	
GARP150	DS5012	1	21/Aug. (18Z)	22/Aug. (05Z)	75	19	
GARP151	DS5013	1	21/Aug. (22Z)	22/Aug. (07Z)	75	19	
GARP152	DS5014	1	22/Aug (09Z)	22/Aug. (16Z)	75	19	
GARP153	DS5015	1	22/Aug. (16Z)	22/Aug. (23Z)	75	19	
GARP154	DS5016	1	22/Aug (23Z)	23/Aug. (08Z)	75	19	
GARP155	DS5017	1	23/Aug. (08Z)	23/Aug. (17Z)	75	19	
GARP156	DS5018	1	23/Aug. (06Z)	23/Aug. (22Z)	75	19	
GARP157	DS5019	1	23/Aug. (22Z)	24/Aug. (09Z)	75	19	
GARP158	DS5020	1	24/Aug. (09Z)	24/Aug. (16Z)	75	19	
GARP159	DS5021	1	24/Aug. (16Z)	24/Aug. (23Z)	75	19	
GARP160	DS5022	1	24/Aug. (23Z)	25/Aug. (05Z)	75	10	
GARP161	DS5023	1	25/Aug. (05Z)	25/Aug. (12Z)	75	19	

GARP DST Data Tape Archive

Tape Slot Number	Tape Number	Level Number	Beginning Date & Time	Ending Date & Time	Year	Number of Files	Notes
GARP162	DS5024	1	25/Aug. (12Z)	25/Aug. (20Z)	75	19	
GARP163	DS5025	1	25/Aug. (21Z)	26/Aug. (03Z)	75	19	
GARP164	DS5026	1	26/Aug. (03Z)	26/Aug. (11Z)	75	19	
GARP165	DS5027	1	27/Aug. (10Z)	27/Aug. (17Z)	75	19	
GARP166	DS5028	1	27/Aug. (19Z)	28/Aug. (01Z)	75	19	
GARP167	DS5029	1	28/Au-. (00Z)	29/Aug. (03Z)	75	19	
GARP168	DS5030	1	28/Aug. (10Z)	28/Aug. (16Z)	75	19	
GARP169	DS5031	1	28/Aug (17Z)	28/Aug. (22Z)	75	16	
GARP170	DS5032	1	29/Aug (12Z)	29/Aug. (14Z)	75	10	
GARP171	DS5033	1	29/Aug. (14Z)	29/Aug. (19Z)	75	16	
GARP172	DS5034	1	29/Aug. (16Z)	30/Aug. (05Z)	75	19	
GARP173	DS5035	1	30/Aug. (05Z)	30/Aug. (12Z)	75	19	
GARP174	DS5036	1	30/Aug. (12Z)	30/Aug. (19Z)	75	19	
GARP175	DS5037	1	30/Aug. (19Z)	31/Aug. (01Z)	75	19	
GARP176	DS5038	1	31/Aug (03Z)	31/Aug. (09Z)	75	19	
GARP177	DS5039	1	31/Aug. (09Z)	31/Aug. (16Z)	75	19	
GARP178	DS5040	1	31/Aug. (22Z)	01/Sep. (05Z)	75	19	
GARP179	DS5041	1	01/Sep. (07Z)	01/Sep. (14Z)	75	19	
GARP180	DS5042	1	01/Sep. (07Z)	01/Sep (21Z)	75	19	
GARP181	DS5043	1	01/Sep. (21Z)	02/Sep. (01Z)	75	16	
GARP182	DS5044	1	02/Sep. (10Z)	02/Sep. (22Z)	75	19	
GARP183	DS5045	1	02/Sep. (13Z)	02/Sep. (20Z)	75	19	
GARP184	DS5046	1	02/Sep. (20Z)	03/Sep. (05Z)	75	19	
GARP185	DS5047	1	02/Sep. (22Z)	03/Sep. (04Z)	75	19	
GARP186	DS5048	1	03/Sep (04Z)	03/Sep. (11Z)	75	19	
GARP187	DS5049	1	03/Sep. (11Z)	03/Sep. (16Z)	75	19	
GARP188	DS5050	1	03/Sep. (23Z)	04/Sep. (05Z)	75	19	
GARP189	DS5051	1	04/Sep. (06Z)	04/Sep (13Z)	75	19	
GARP190	DS5052	1	04/Sep. (13Z)	04/Sep. (17Z)	75	12	
GARP191	DSTICE	3	01/Jan. (00Z)	30/Sep. (18Z)	75	181	4
GARP192	DS2001	1	11/Dec. (00Z)	30/May (00Z)	72	1	5

GARP DST Data Tape Archive

Tape Slot Number	Tape Number	Level Number	Beginning Date & Time	Ending Date & Time	Year	Number of Files	Notes
GARP193	DA2592	2	01/Feb. (00Z)	02/Feb. (18Z)	76	16	
GARP194	DA2593	2	03/Feb. (00Z)	04/Feb. (18Z)	76	16	
GARP195	DA2594	2	05/Feb. (00Z)	06/Feb. (18Z)	76	16	
GARP196	DA2595	2	07/Feb. (00Z)	08/Feb. (18Z)	76	16	
GARP197	DA2596	2	09/Feb. (00Z)	10/Feb. (18Z)	76	16	
GARP198	DA2597	2	11/Feb. (00Z)	12/Feb. (18Z)	76	16	
GARP199	DA2598	2	13/Feb. (00Z)	14/Feb. (18Z)	76	16	
GARP200	DA2599	2	15/Feb. (00Z)	16/Feb. (18Z)	76	16	
GARP201	DA2600	2	17/Feb. (00Z)	18/Feb. (18Z)	76	16	
GARP202	DA2601	2	19/Feb. (00Z)	20/Feb. (18Z)	76	16	
GARP203	DA2616	2	21/Feb. (00Z)	22/Feb (18Z)	76	16	
GARP204	DA2617	2	23/Feb (00Z)	24/Feb (18Z)	76	16	
GARP205	DA2618	2	25/Feb. (00Z)	26/Feb. (18Z)	76	16	
GARP206	DA2619	2	27/Feb (00Z)	28/Feb. (18Z)	76	16	
GARP207	DA2620	2	29/Feb. (00Z)	01/Mar. (18Z)	76	16	
GARP208	DA2621	2	02/Mar. (00Z)	03/Mar. (18Z)	76	16	
GARP209	DA2622	2	04/Mar (00Z)	05/Mar. (18Z)	76	16	
GARP210	DA2646	3	01/Feb. (00Z)	07/Feb. (12Z)	76	14	
GARP211	DA2647	3	08/Feb. (00Z)	14/Feb. (12Z)	76	14	
GARP212	DA2648	3	15/Feb. (00Z)	21/Feb. (12Z)	76	14	
GARP213	DA2649	3	22/Feb. (00Z)	28/Feb. (12Z)	76	14	
GARP214	DA2650	3	29/Feb. (00Z)	05/Mar. (00Z)	76	11	
GARP215	DS6065	1			76		6
GARP216	DS6066	1			76		6
GARP217	DS6067	1			76		6
GARP218	DS6068	1			76		6
GARP219	DS6069	1			76		6
GARP220	DS6070	1			76		6
GARP221	DS6071	1			76		6
GARP222	DS6072	1			76		6
GARP223	DS6073	1			76		6
GARP224	DS6074	1	24/Feb. (18Z)	25/Feb. (00Z)	76	19	

GARP DST Data Tape Archive

Tape Slot Number	Tape Number	Level Number	Beginning Date & Time	Ending Date & Time	Year	Number of Files	Notes
GARP 225	DS6075	1	25/Feb. (00Z)	25/Feb. (06Z)	76	19	
GARP226	DS6076	1	25/Feb. (07Z)	25/Feb. (15Z)	76	19	
GARP227	DS6077	1	25/Feb. (15Z)	26/Feb. (01Z)	76	19	
GARP228	DS6078	1	26/Feb. (01Z)	26/Feb. (07Z)	76	19	
GARP229	DS6079	1			76		6
GARP230	DS6080	1	26/Feb. (15Z)	26/Feb. (21Z)	76	19	
GARP231	DS6081	1	26/Feb. (22Z)	27/Feb. (05Z)	76	16	
GARP232	DS6082	1	27/Feb. (05Z)	27/Feb (12Z)	76	19	
GARP233	DS6083	1			76		6
GARP234	DS6084	1	27/Feb. (19Z)	28/Feb. (02Z)	76	19	
GARP235	DS6084	1	28/Feb. (02Z)	28/Feb. (08Z)	76	19	
GARP236	DS6086	1	28/Feb. (10Z)	28/Feb. (17Z)	76	19	
GARP237	DS6087	1	28/Feb. (18Z)	29/Feb. (01Z)	76	19	
GARP238	DS6088	1			76		6
GARP239	DS6089	1	29/Feb. (07Z)	29/Feb (14Z)	76	19	
GARP240	DS6090	1	29/Feb. (14Z)	29/Feb. (21Z)	76	19	
GARP241	DS6091	1	29/Feb. (21Z)	01/Mar. (04Z)	76	19	
GARP242	DS6092	1	01/Mar. (04Z)	01/Mar. (12Z)	76	19	
GARP243	DS6093	1	01/Mar. (12Z)	01/Mar. (19Z)	76	19	
GARP244	DS6094	1	01/Mar. (19Z)	02/Mar. (01Z)	76	19	
GARP245	DS6095	1	02/Mar. (01Z)	02/Mar. (07Z)	76	19	
GARP246	DS6096	1	02/Mar. (08Z)	02/Mar. (15Z)	76	19	
GARP247	DS6097	1	02/Mar. (16Z)	02/Mar. (23Z)	76	19	
GARP248	DS6098	1	02/Mar. (23Z)	03/Mar. (05Z)	76	19	
GARP249	DS6099	1	03/Mar. (05Z)	03/Mar. (12Z)	76	19	
GARP250	DS6100	1	03/Mar. (12Z)	03/Mar. (16Z)	76	19	
GARP251	DS6101	1	03/Mar. (17Z)	04/Mar. (00Z)	76	19	
GARP252	DS6102	1	04/Mar. (00Z)	04/Mar (6Z)	76	19	
GARP253	DS6103	1	04/Mar. (06Z)	04/Mar. (13Z)	76	19	
GARP254	DS6104	1	04/Mar. (13Z)	04/Mar (20Z)	76	19	
GARP255	DS6105	1	04/Mar. (20Z)	04/Mar. (04Z)	76	19	

Notes

1. Level 1 subset covering Hurricane Caroline 0°-40°N, 60°-120°W.
2. Collocated match of radiosondes and Nimbus soundings.
3. Level I subset covering Hurricane Doris 20°-80°N, 35°-85°W.
4. ESMR sea ice and rain rate maps.
5. Nimbus 5 ITPR scan data covering selected periods from '72-'76.
6. Awaiting replacement tapes from NESS archives.

Appendix B.

Archival Tape Format of LEVEL-1 Data

Archival Tape Format of LEVEL-1 Data

This data was acquired from instruments flown on board Nimbus-6. The orbit archive data tape contains three types of data, each in a separate file:

- High Resolution Infrared Radiometer Sounder (HIRS) calibrated radiances
- Scanning Microwave Spectrometer (SCAMS) calibrated radiances
- Temperature and humidity sounding retrieval data

The files are arranged in multiples of three as shown in Figure B-1. Each set of three files contains data covering a time period of approximately one orbit.

2.1 File Format

Each file will contain "N" number of records needed to contain all the data within a particular orbit. The record size and format in each file is different. This is shown in Table B-1.

Table B-1. Record Sizes of Level-1 Data Tape

	Bytes	Format	Words
HIRS	3600	Integer* 4	900
SCAMS	480	Integer* 4	120
RETRIEVAL	2000	Real* 4	500

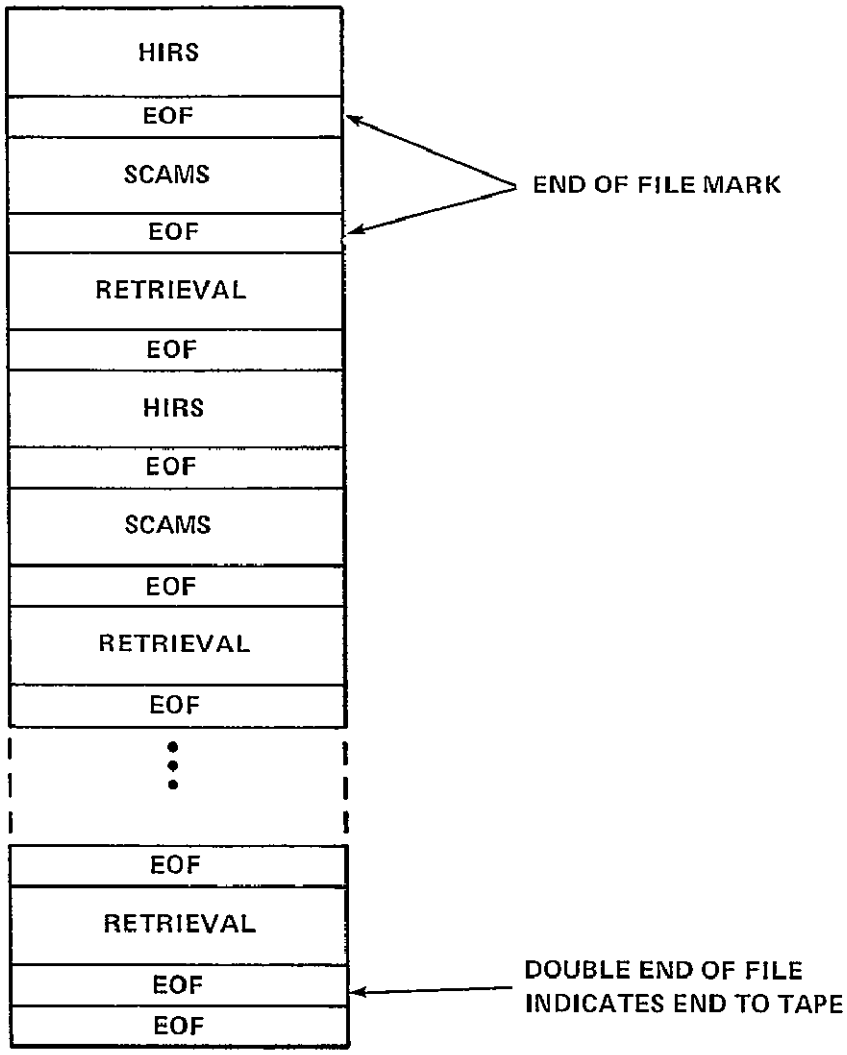


Figure B-1. Tape Structure of Level-1 Data Tape

Record descriptions for the HIRS, SCAMS, and RETRIEVAL data appear in Tables B-2, B-3, B-4, respectively. Table B-5 is provided to define the data types of the items described in these tables.

A representation of the logical groupings of HIRS radiances which were considered in the determination of clear column radiances and in the extraction of the sounding retrievals is shown in Figure B-2.

Table B-2. HIRS Data Record Description

Word	Type*	Description
1	1	Time (GMT in seconds)
2	1	Julian Day
3	1	Year
4-45	1	Sounding quality flags (42 earth samples where 0=Data Acquired; 1=no data acquired)
46-759	4	IR calibrated channel data (17 channels for 42 earth samples)
760-801	2	Latitude (42 earth samples) (see Note 1)
802-843	2	Longitude (42 earth samples) (see Note 2)
844-885	2	Zenith angle (42 earth samples) (see Note 3)
886	1	Line number
887	1	Grid number
888-900	--	Zero file

* See Table B-5

The HIRS Central Frequencies (cm^{-1}) are:

Channel	Frequency		Channel	Frequency	
1	669		10	1508	6.3 μm H_2O
2	679		11	2191	
3	690		12	2212	
4	702	15 μm CO_2	13	2244	4.3 μm CO_2
5	717		14	2275	
6	733		15	2358	
7	749		16	2691	3.7 m window
8	900	11 μm window	17	~14000 (visible)	
9	1223	8 μm H_2O			

Notes:

1. Latitude in degrees where a positive (+) value is north and a negative (-) value is south.
2. Longitude in degrees where a positive (+) value is east Greenwich and a negative (-) value is west.
3. Zenith angle in degrees where a positive (+) value is north of the trackline.

Table B-3. SCAMS Data Record Description

Word	Type*	Description
1	1	Time (GMT in seconds)
2	1	Julian Day
3	1	Year
4-16	1	Sounding quality flag (13 earth samples where 0=data acquired, 1=no data acquired)
17-81	2	MW calibrated channel data (5 channel for 13 earth samples) (see Note 4)
82-94	2	Latitude (13 earth samples) (see Note 1)
95-107	2	Longitude (13 earth samples) (see Note 2)
108-120	2	Zenith angle (13 earth samples) (see Note 3)

* See Table B-5

Notes:

1. Latitude in degrees where a poisitive (+) value is north and a negative (-) value is south.

2. Longitude in degrees where a positive (+) value is east of Greenwich and a negative (-) value is west.

3. Zenith angle in degrees where a positive (+) value is north of the trackline.

4. The SCAMS antenna temperatures are in degrees Kelvin. The order of the channels for each FOV is as follows:

   22.23 GHz
   31.40 GHz
   52.85 GHz
   53.85 GHz
   55.45 GHz

Table B-4. Retrieval Data Record Description

Word	Type*	Description
1	5	Date (YYMMDD)
2	5	Time (HHMMSS)
3	5	Latitude (see Note 1)
4	5	Longitude (see Note 2)
5	5	Sfc elevation (m)
6	5	Sfc pressure (mb)
7	5	Solar zenith angle (see Note 3)
8	5	Albedo (0. -1.), derived from visible channel
9	5	Sfc albedo (0. -1), derived from visible channel
10	5	Sfc emissivity (1.), derived from 3.7 μradiance
11	5	Solar component of 3.7μ radiance (mw/m^2 - sr - cm^{-1}) (see Note 4)
12	5	Sfc temp (deg K) (see Note 5)
13	5	Total outgoing longwave flux (wm^{-2})
14-30	5	Channel flags - indicating source of clear column radiances (CCR) (see Note 6)
31	5	Sfc temp flag
32-47	5	Clear column brightness temperatures (deg K)
38	5	Zenith angle (deg)
49-65	5	CCR error estimates
66-70	5	SCAMS antenna temperatures (deg K) (5 channels) Chan. 1 2 3 4 5 Freq. 55.45 53.85 52.85 31.40 22.23
71	5	SCAMS flag
72-407	5	Observed radiances (12 chan X 28 FOV)
408-422	5	Geopot. ht(m) at mand. lvls, 1000-10 mb (see Note 7)
423-437	5	Temp (deg K) at mand. lvls, 1000-10 mb
438-445	5	Dewpt dpress (deg K) at mand. lvls, 1000-200 mb
446-465	5	Temp (deg K) at signif. lvls, 950-1 mb (see Note 8)
466-474	5	Dewpt dpress (deg K) at signif. lvls, 950-350 mb

Table B-4. Retrieval Data Record Description

Word	Type*	Description
475-484	5	Cloud amounts at mand. lvls, 1000-100 mb
485-494	5	Cloud albedos at mand. lvls, 1000-100 mb
495	5	Total water vapor (cm) from HIRS and SCAMS or HIRS only

* See Table B-5

Notes:

1. Latitude in degrees where a positive (+) value is north and a negative (-) value is south.
2. Longitude in degrees where a positive (+) value is east of Greenwich and a negative (-) value is west.
3. Est. true radiance from 11 micro window channel.
4. Est. of sunlight reflect by clouds as indicated by visible channel. Computed as difference of above two.
5. Brightness temp. obtained from CCR from 11 micro window channels.
6. Permissible values are 1, 4, 5, 6, 7 for a 7 X 4 array determining a 28 FOV/scan spot where the definition of values is:

Flag Values	Definition
1	All channels are clear. Output radiances are average of 28 FOVs. Channels 1, 2, and 15 are always 1.
4	Results derived by N-star algorithm.
5	N-star attempt failed. An average of available data attempted. Min-2; Max-10.
6	Desperation - only SCAMS data available. Clear column radiances from HIRS unavailable.
7	If more than 10 available, N-star not performed. An average is computed and the flag is set to 7.

7. The "mandatory" level pressures (mb) are: 1000, 850, 700, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, 10.
8. The "significant" level pressures (mb) are: 950, 920, 780, 670, 620, 570, 475, 430, 350, 135, 115, 85, 60, 25, 15, 7, 5, 3, 2, 1.

Table B-5. Data Type Description

1. Integer quantities right adjusted in 32 bit fields.

2. Integer representation of floating point quantities multiplied by a scaling factor of 100 and rounded, e.g., 145.824 would appear as 14582.

3. Integer representation of floating point quantities multiplied by a scaling factor of 10,000 and rounded, e.g., 10.98756 would appear as 109876.

4. The 17 IR channels will be repeated for each of the 42 earth samples. Channels 1-10 will be in Type 2 Format. Channels 11-16 will be in Type 3 Format. Channel 1 will be in Type 1 Format. All HIRS radiances are in $mw/(m^2\text{-}sr\text{-}cm^{-1})$.

5. Floating point quantities in 32 bit field.

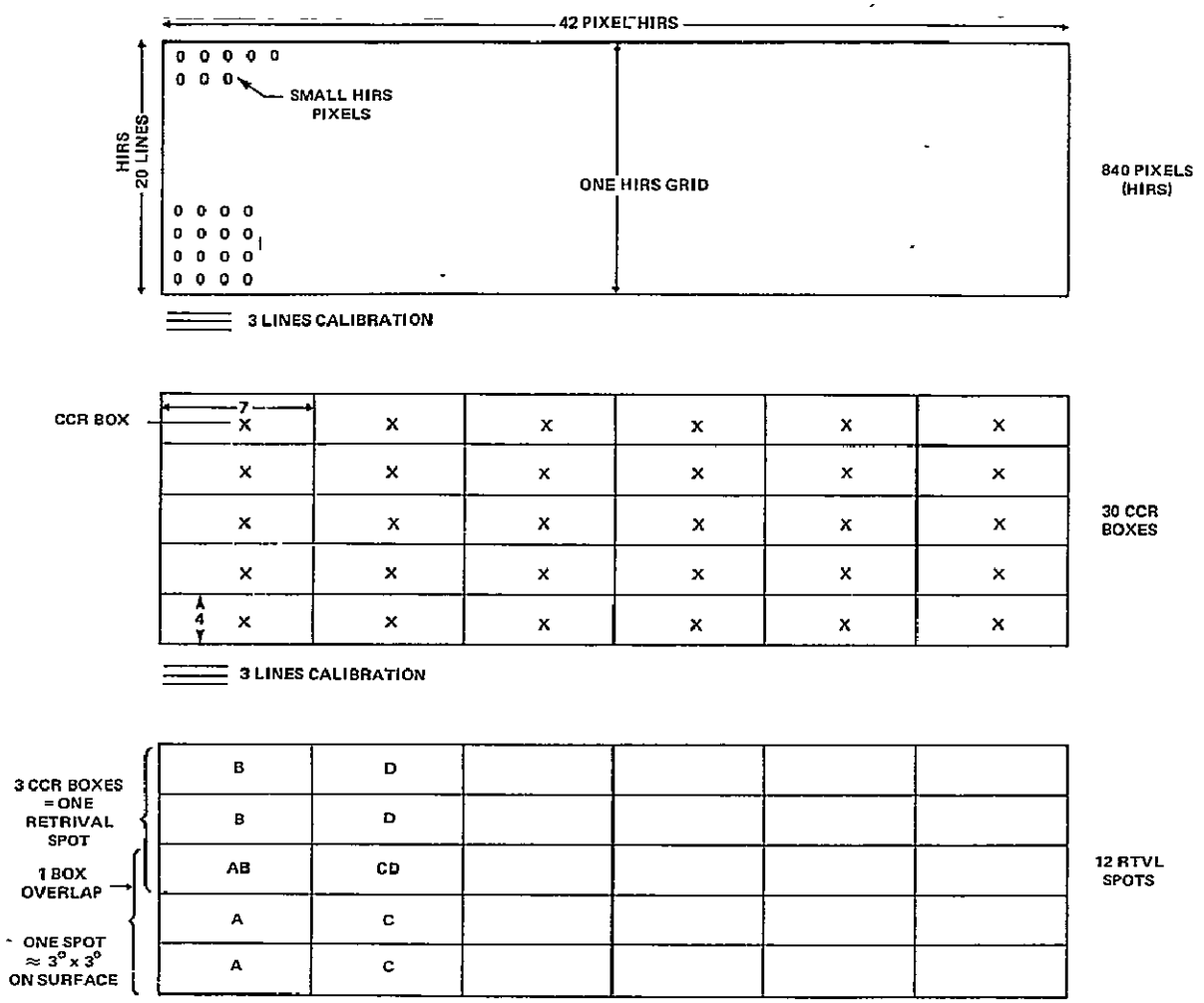
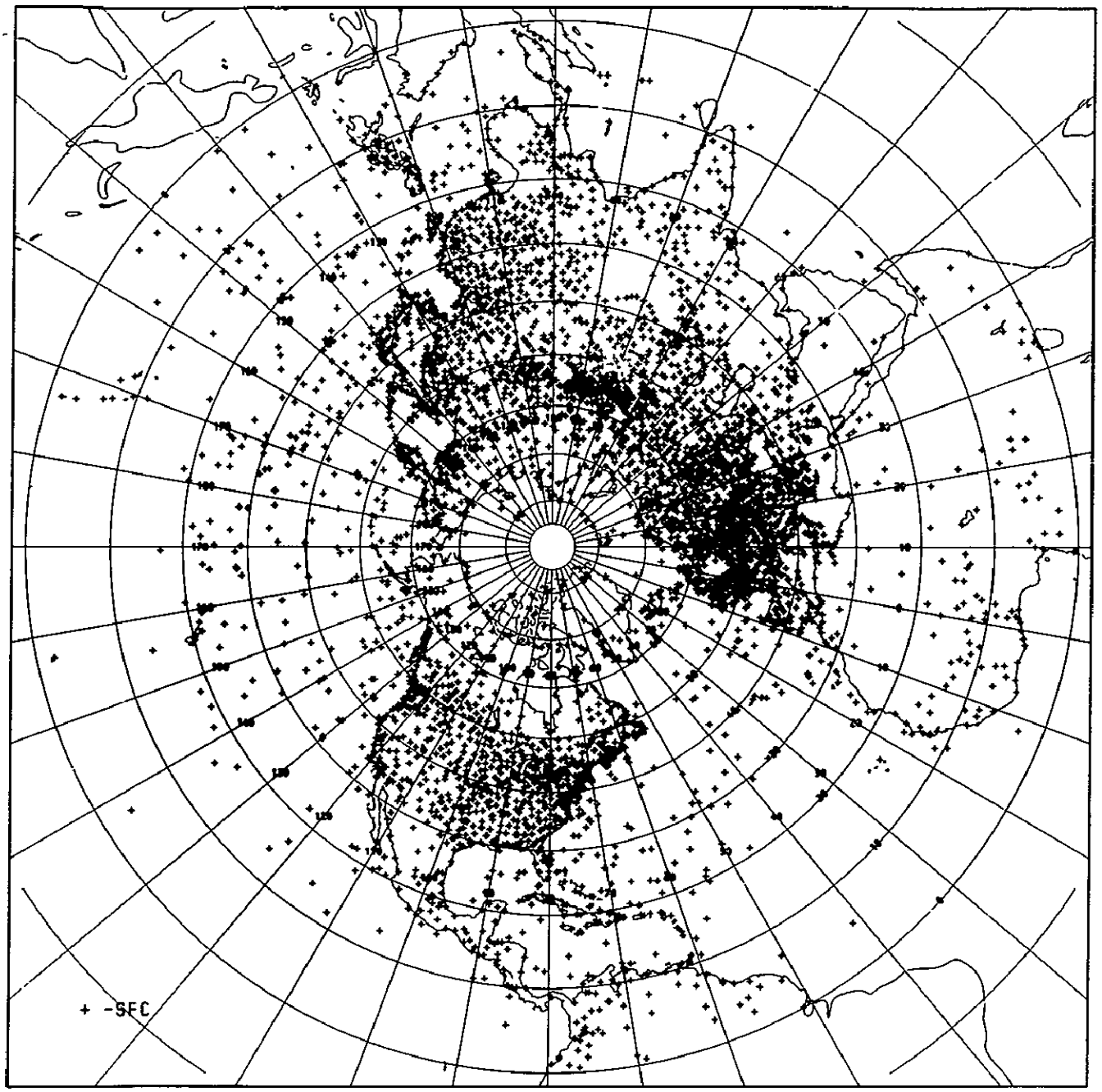


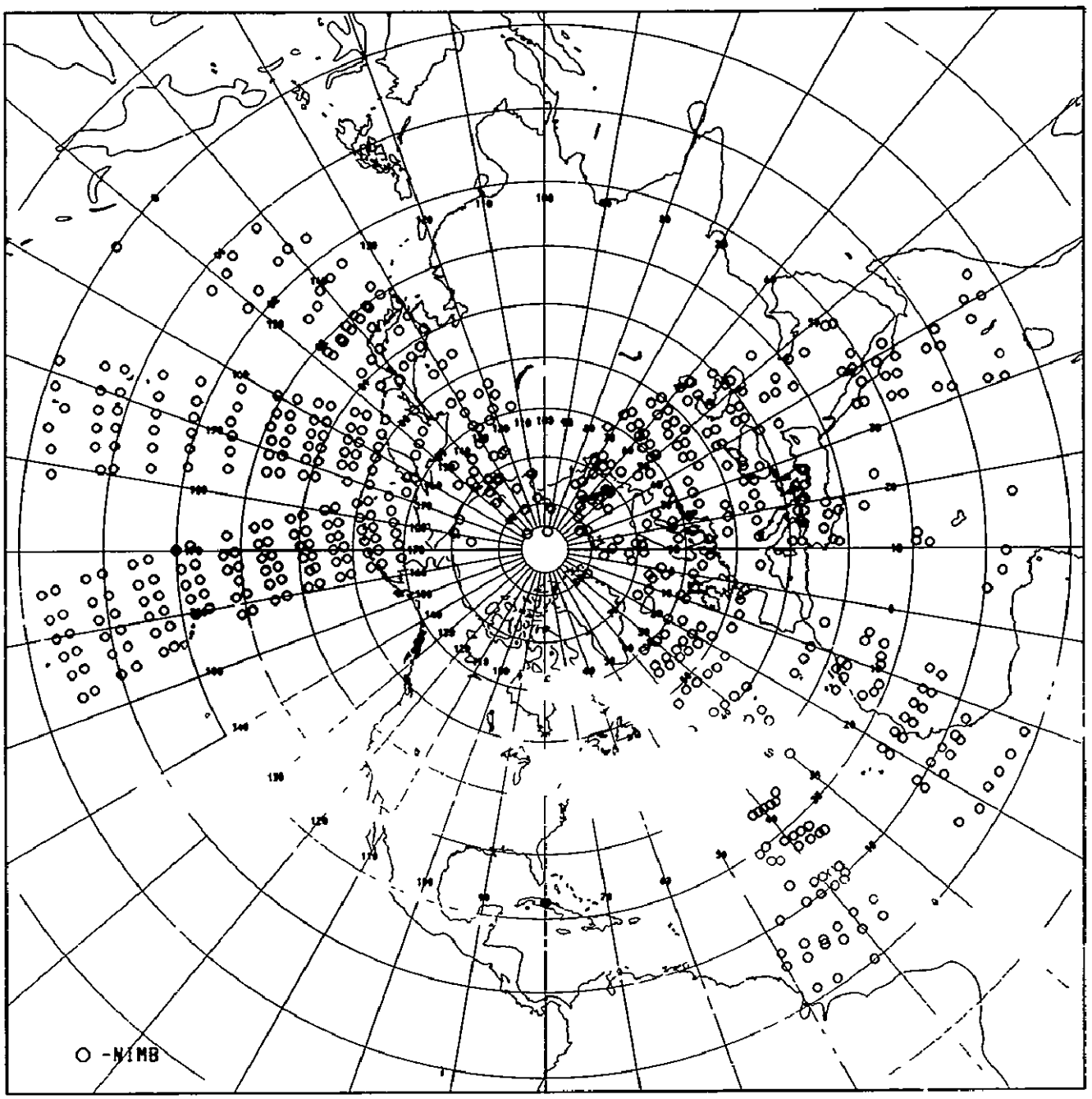
Figure B-2. Logical Groupings of HIRS Radiances for CCR and Sounding Retrievals

Appendix C.

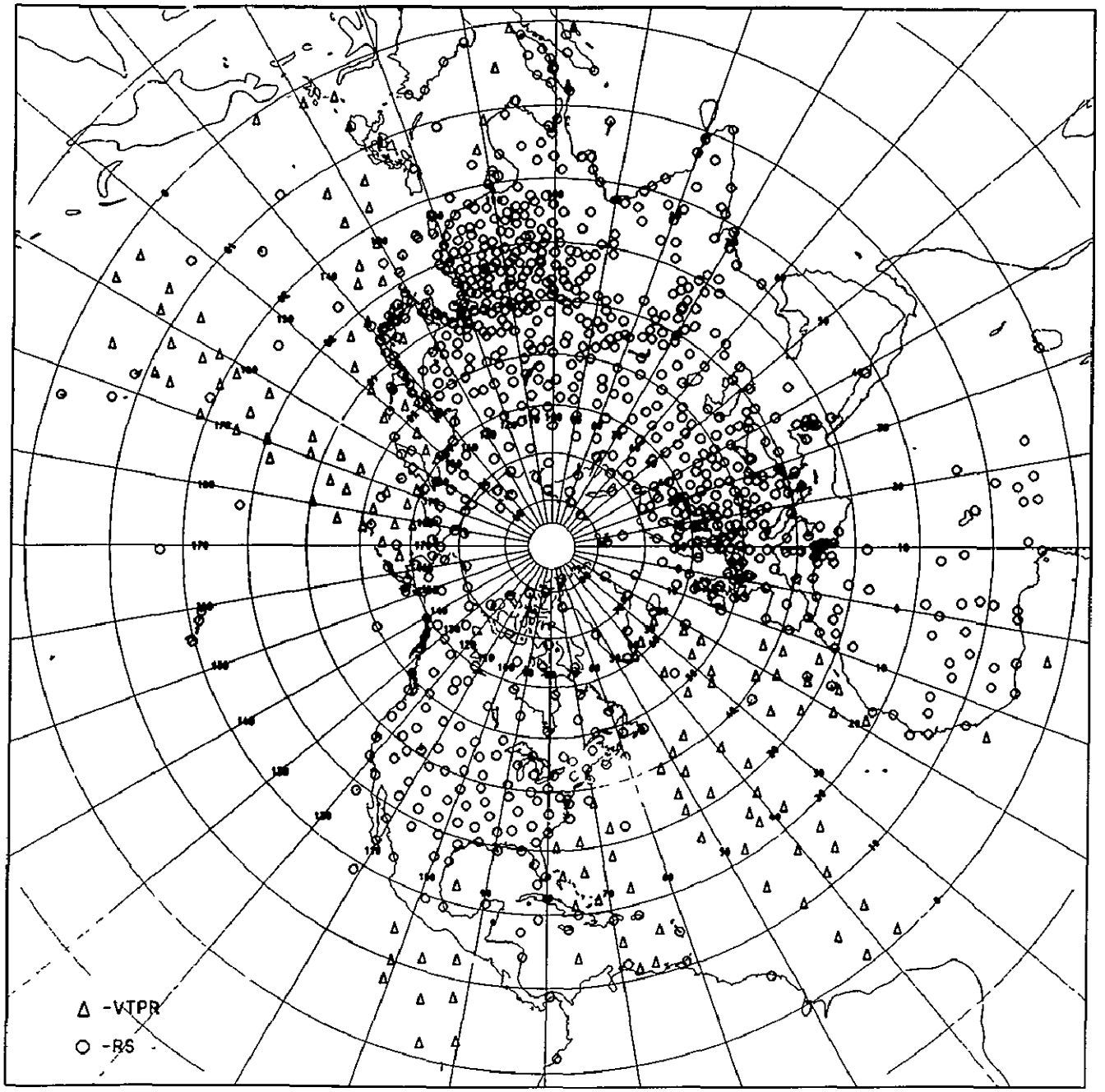
Sample Coverage Maps of Level II Data



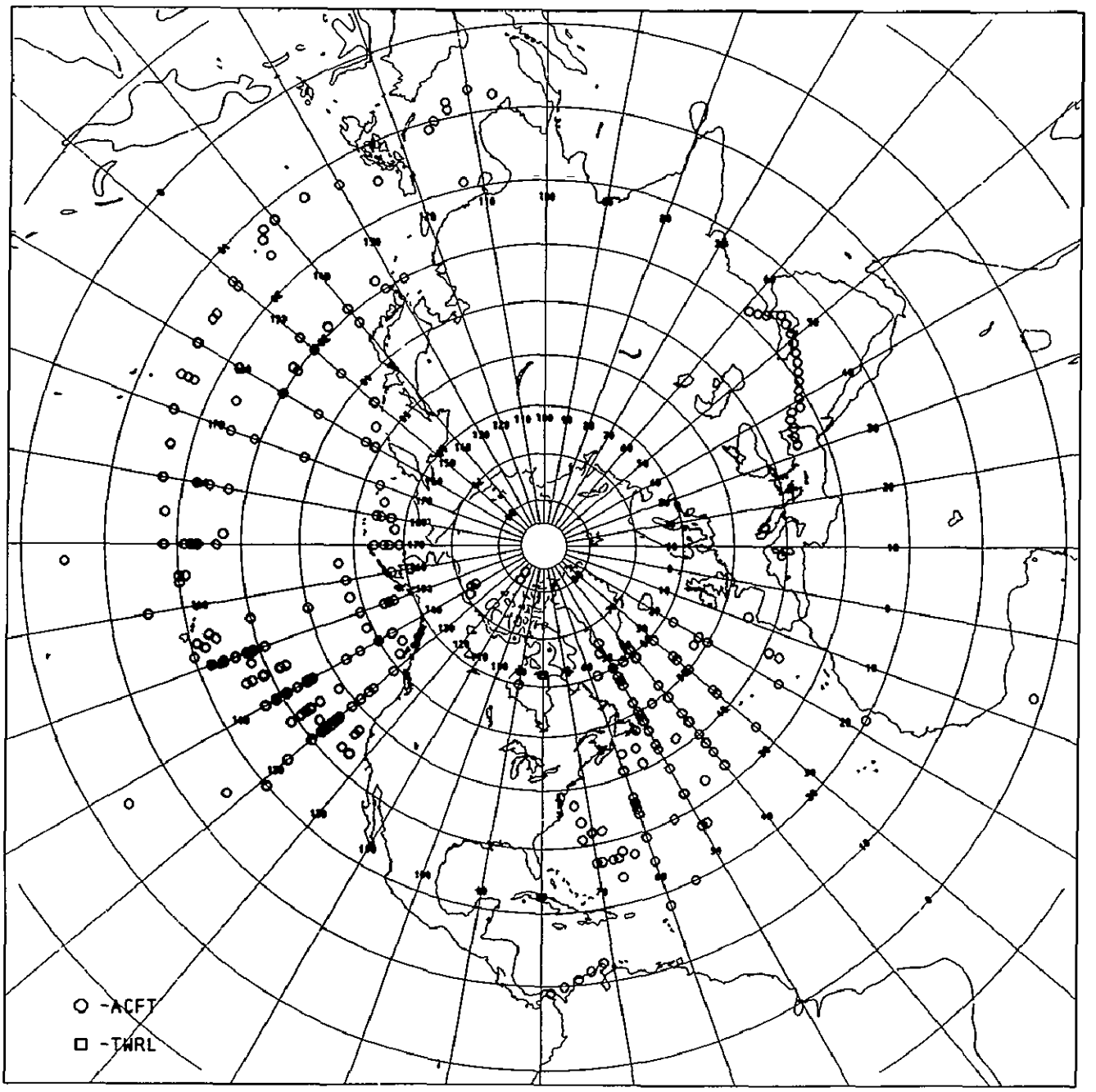
N.H. SURFACE DATA COVERAGE ON NMC2SFC2760201009999WASH



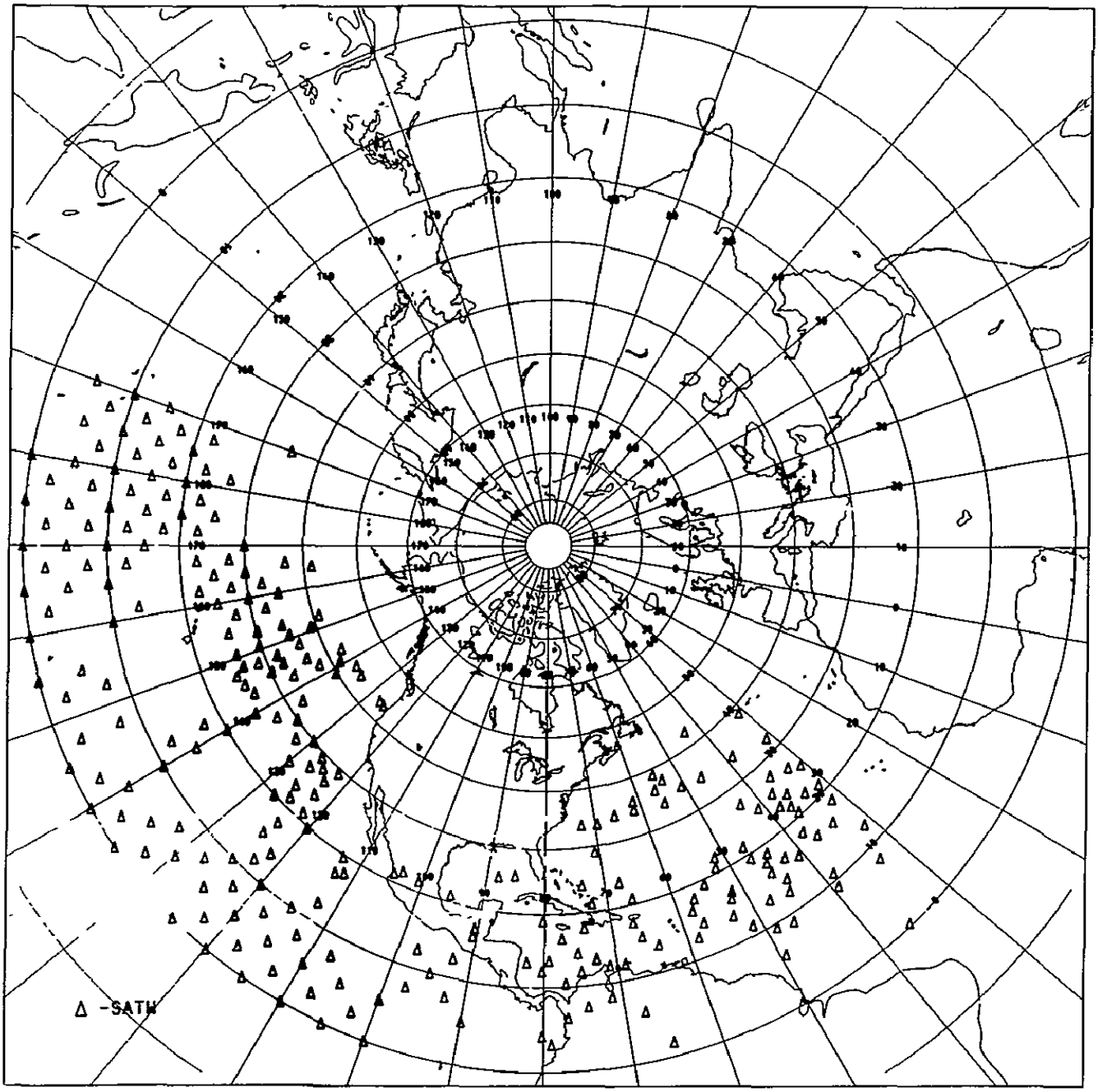
N.H. NIMBUS DATA COVERAGE ON NMC2UAC2760201009999WASH



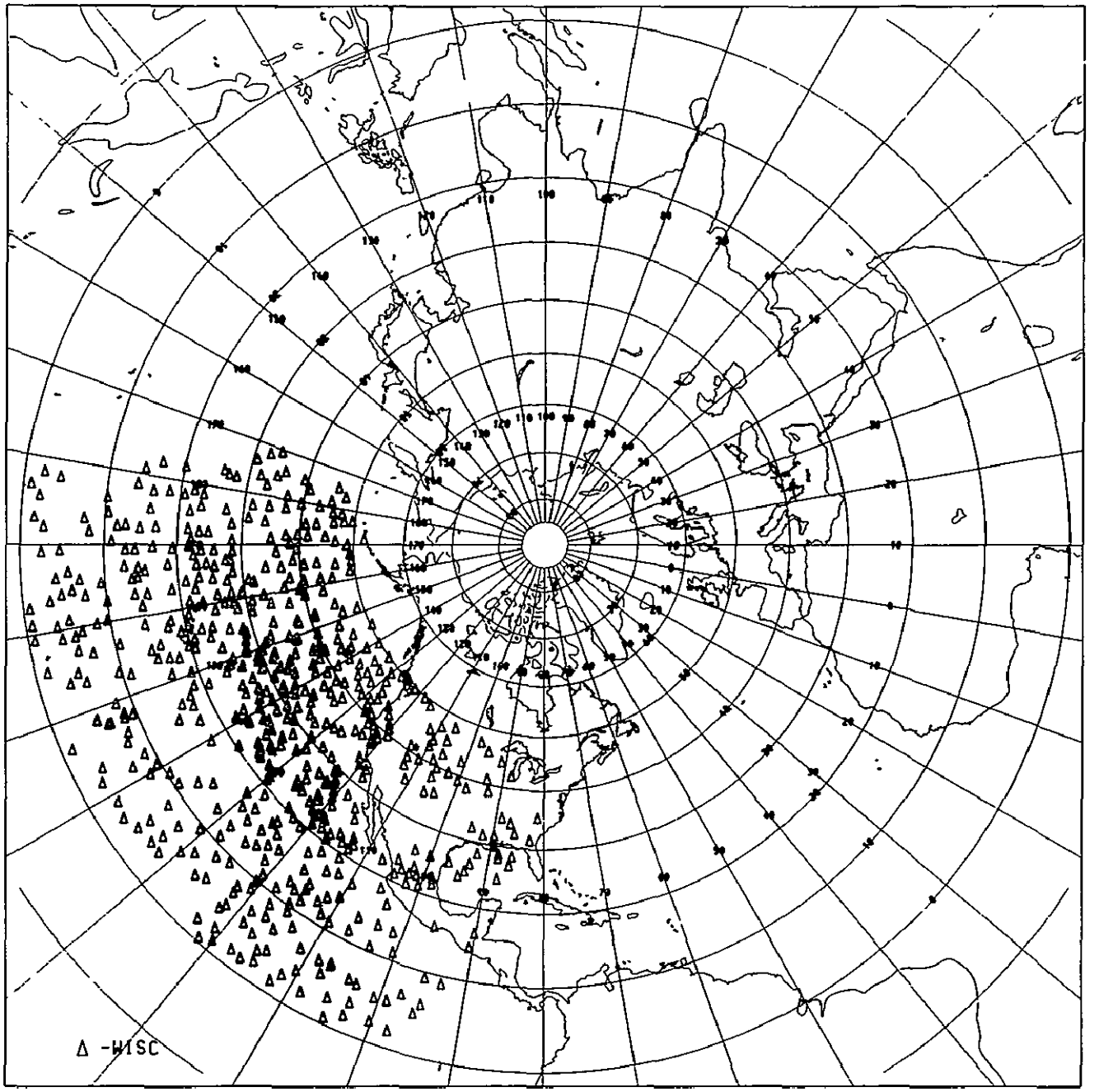
N.H. RADIOSONDE AND VTPR DATA COVERAGE ON NMC2UAC2760201009999WASH



N.H. TWERLE AND AIRCRAFT DATA COVERAGE ON NMC2UAC2760201009999WASH



N.H. SATWIND DATA COVERAGE ON NMC2UAC2760201009999WASH



N.H. WICONSIN WIND DATA COVERAGE ON NMC2UAC2760201009999WASH

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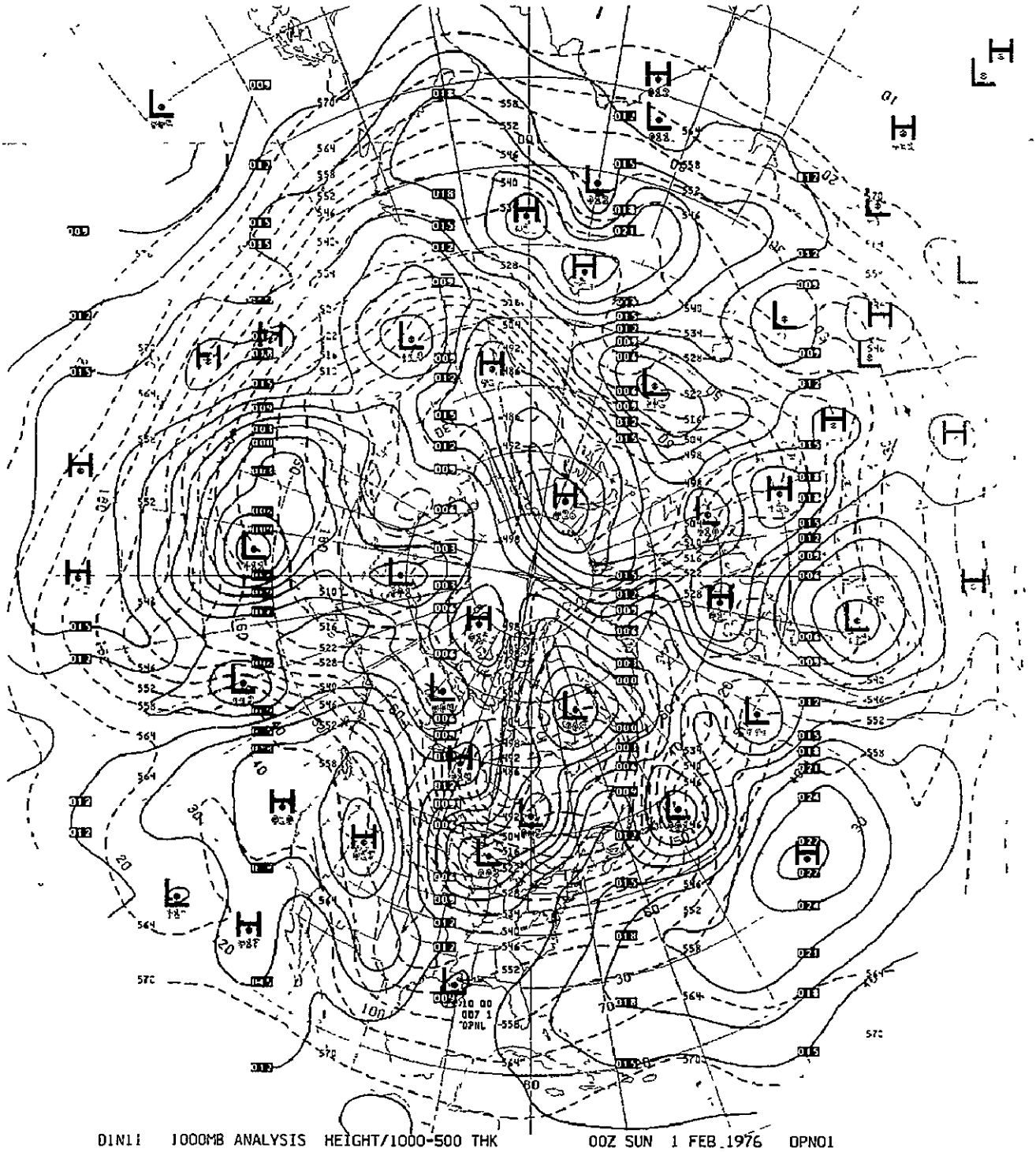
Appendix D.

Sample Contour Products of Level III Data



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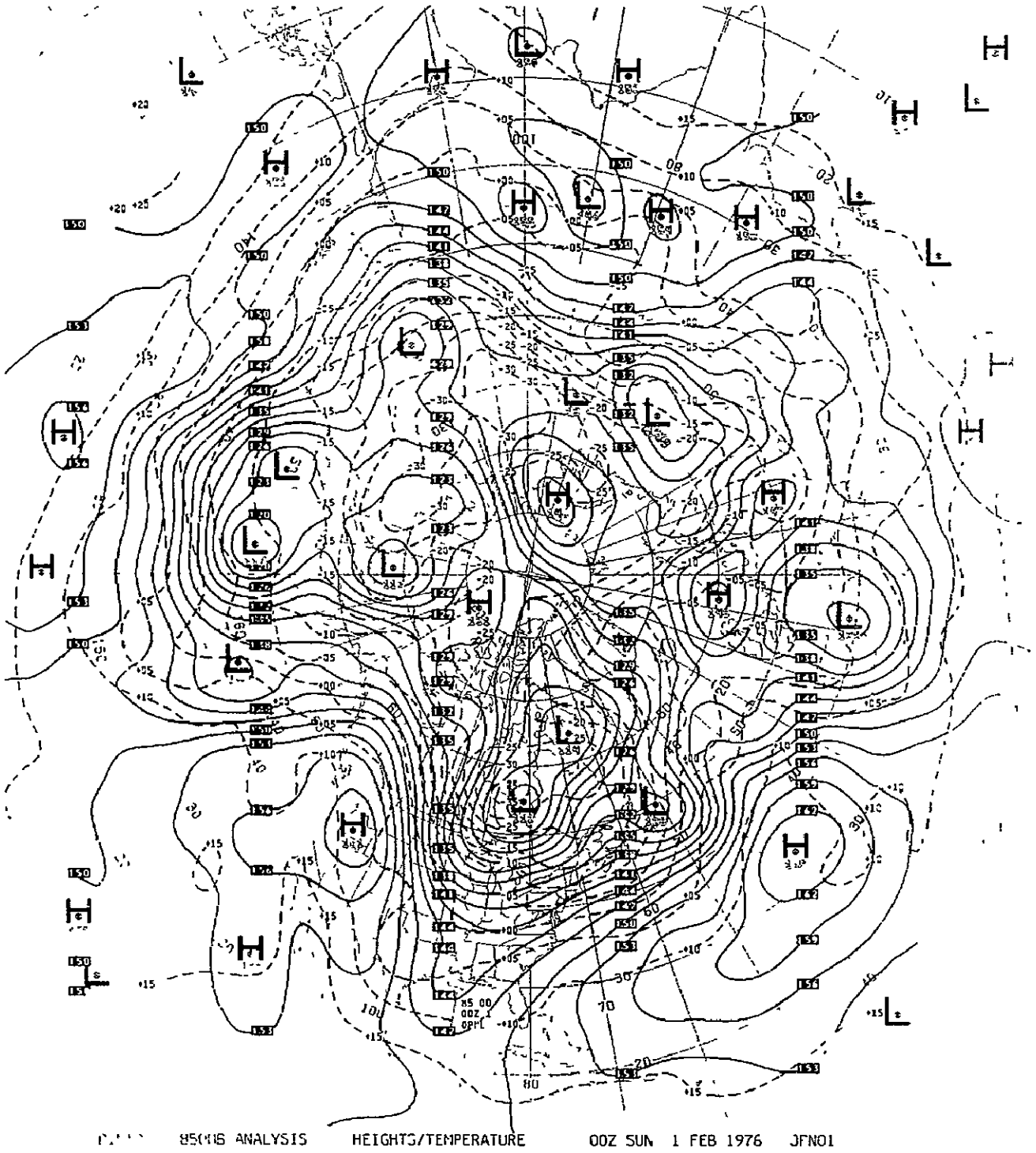

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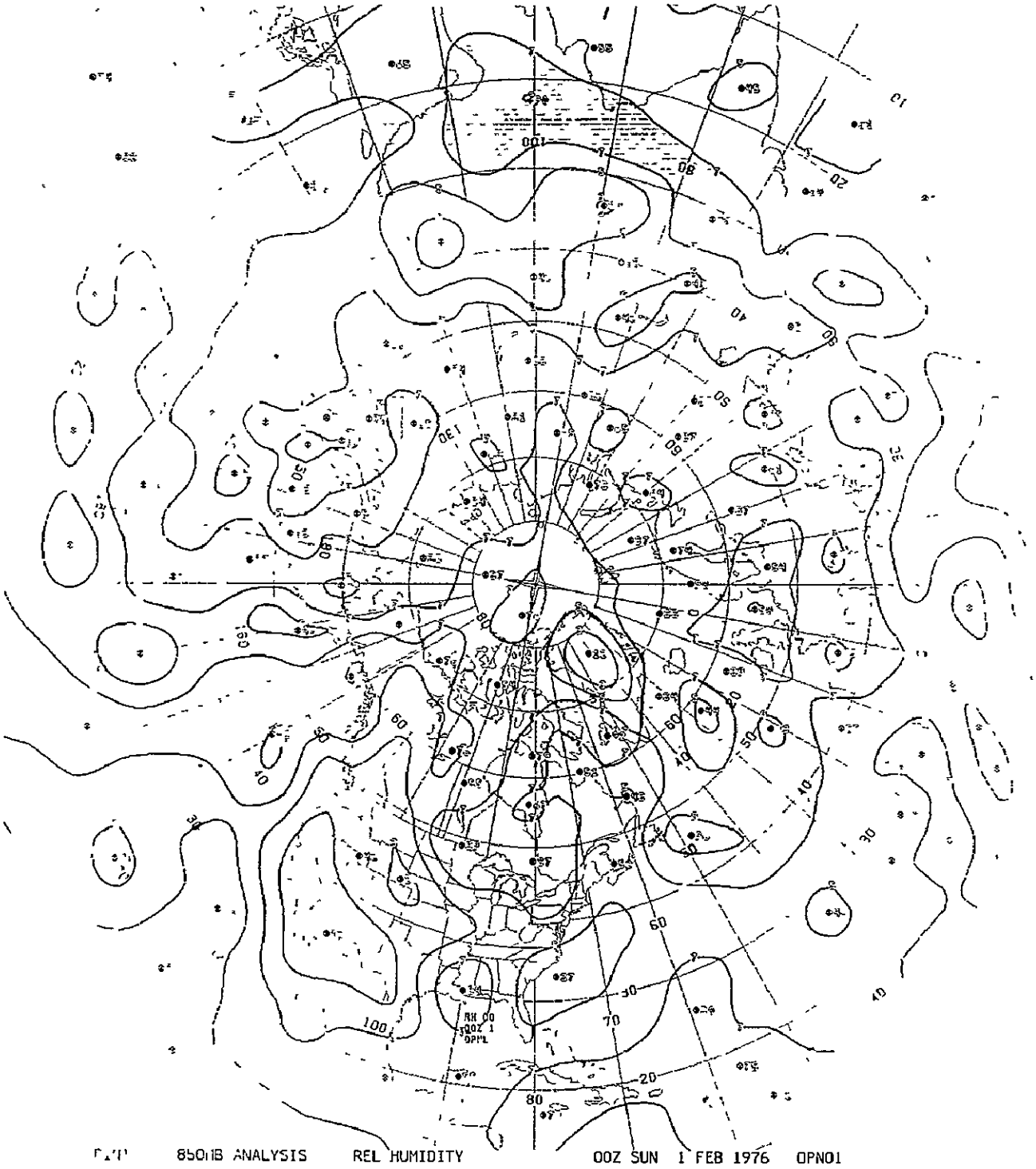
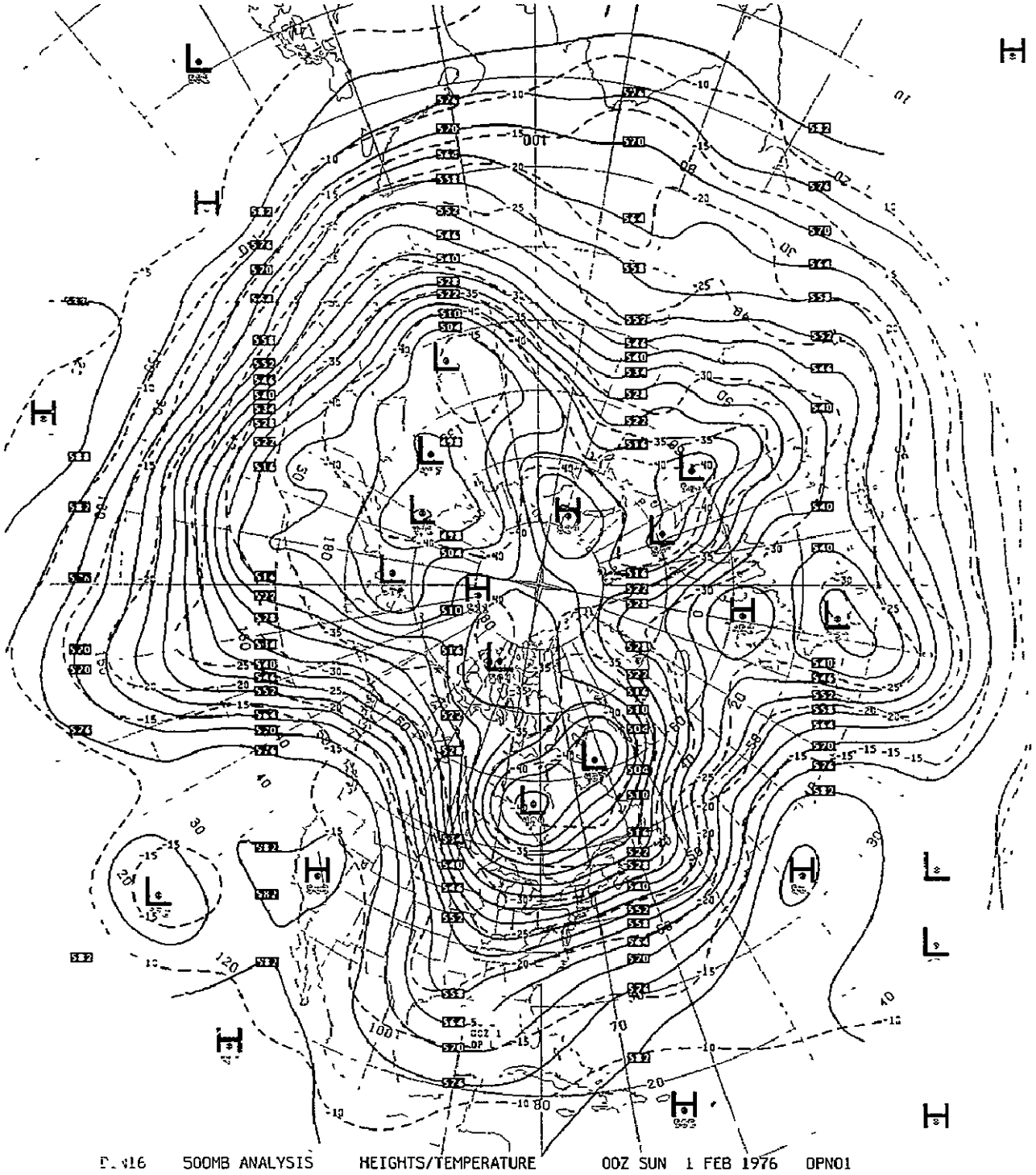

850MB ANALYSIS REL HUMIDITY 00Z SUN 1 FEB 1976 OPN01



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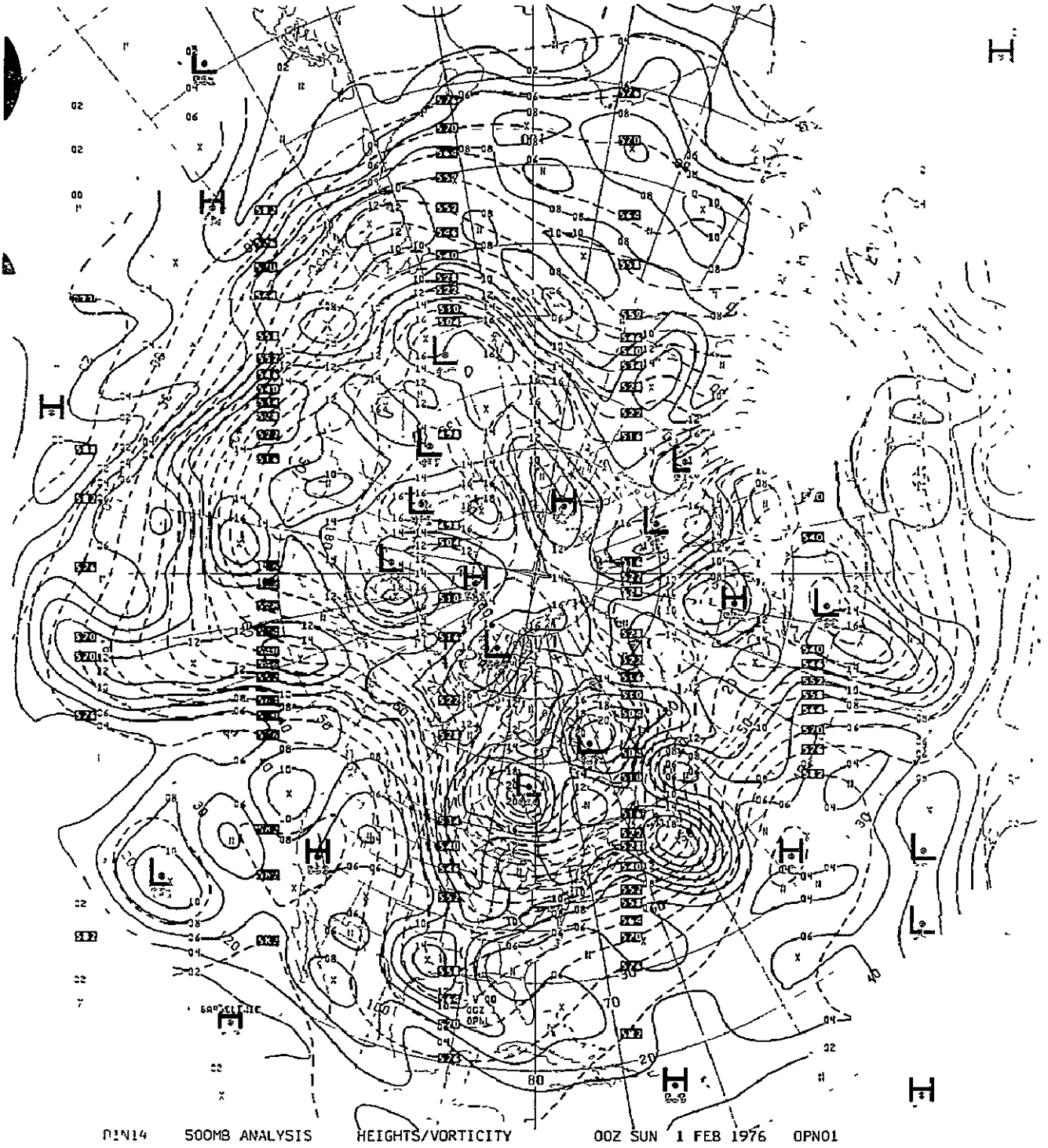
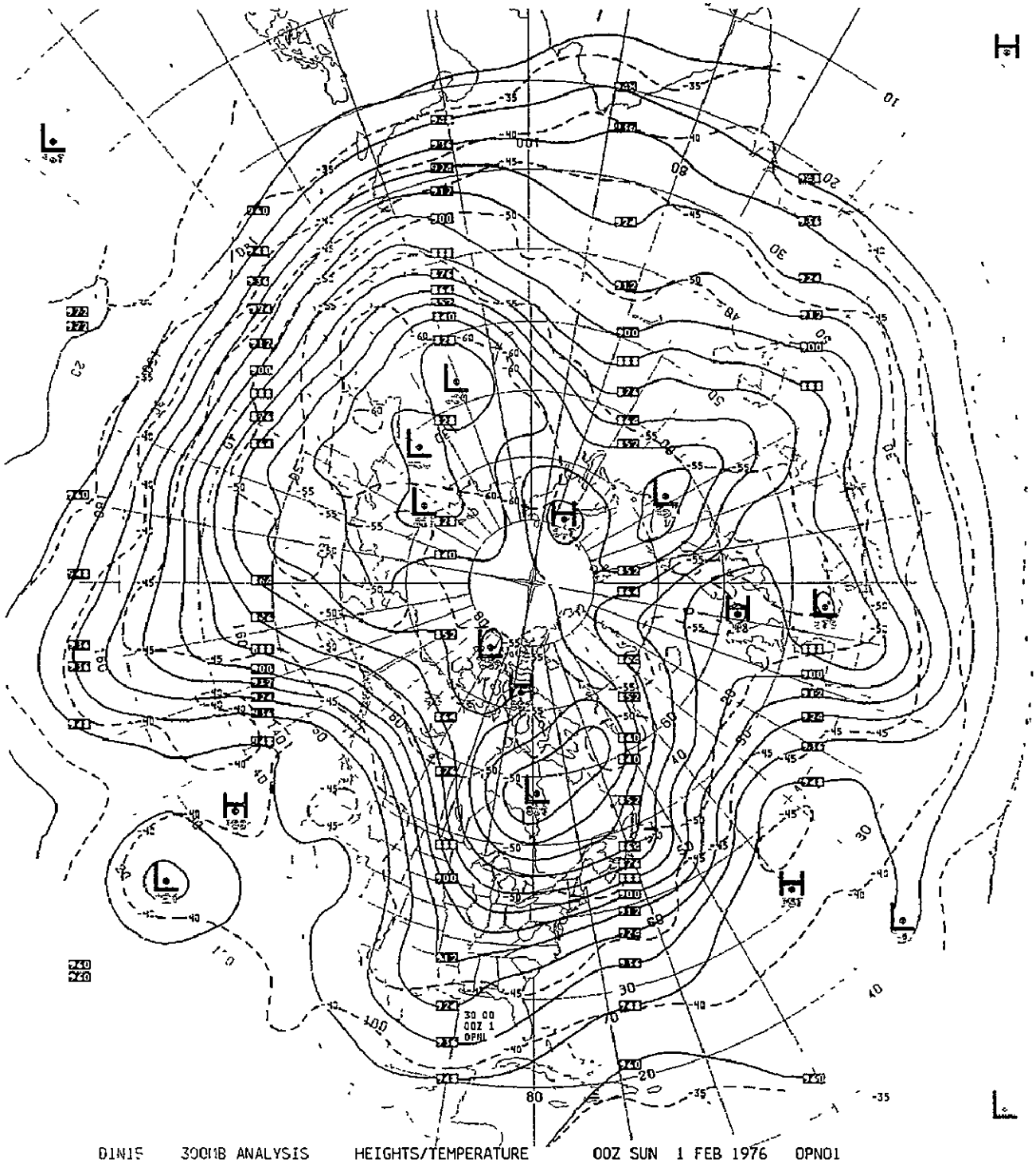
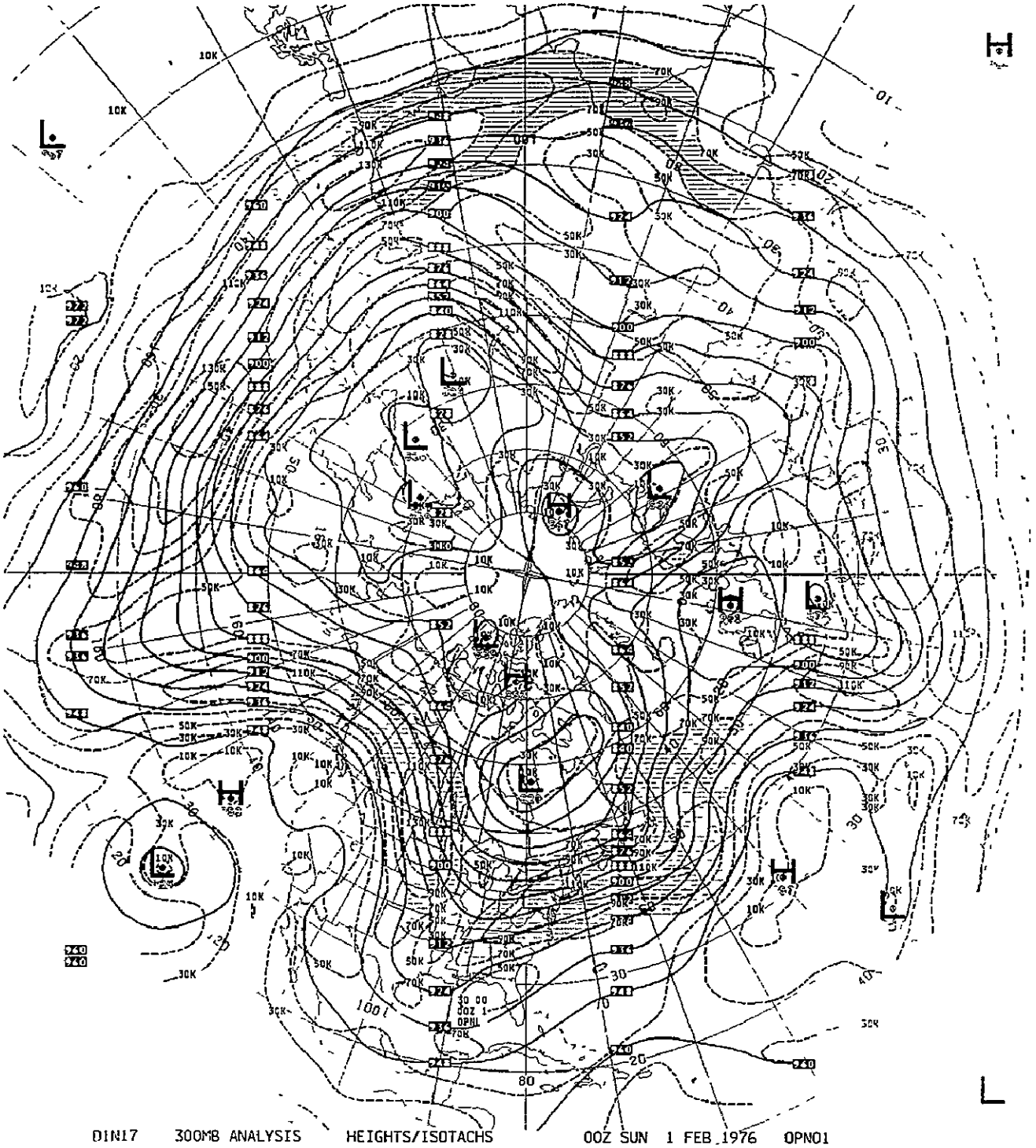
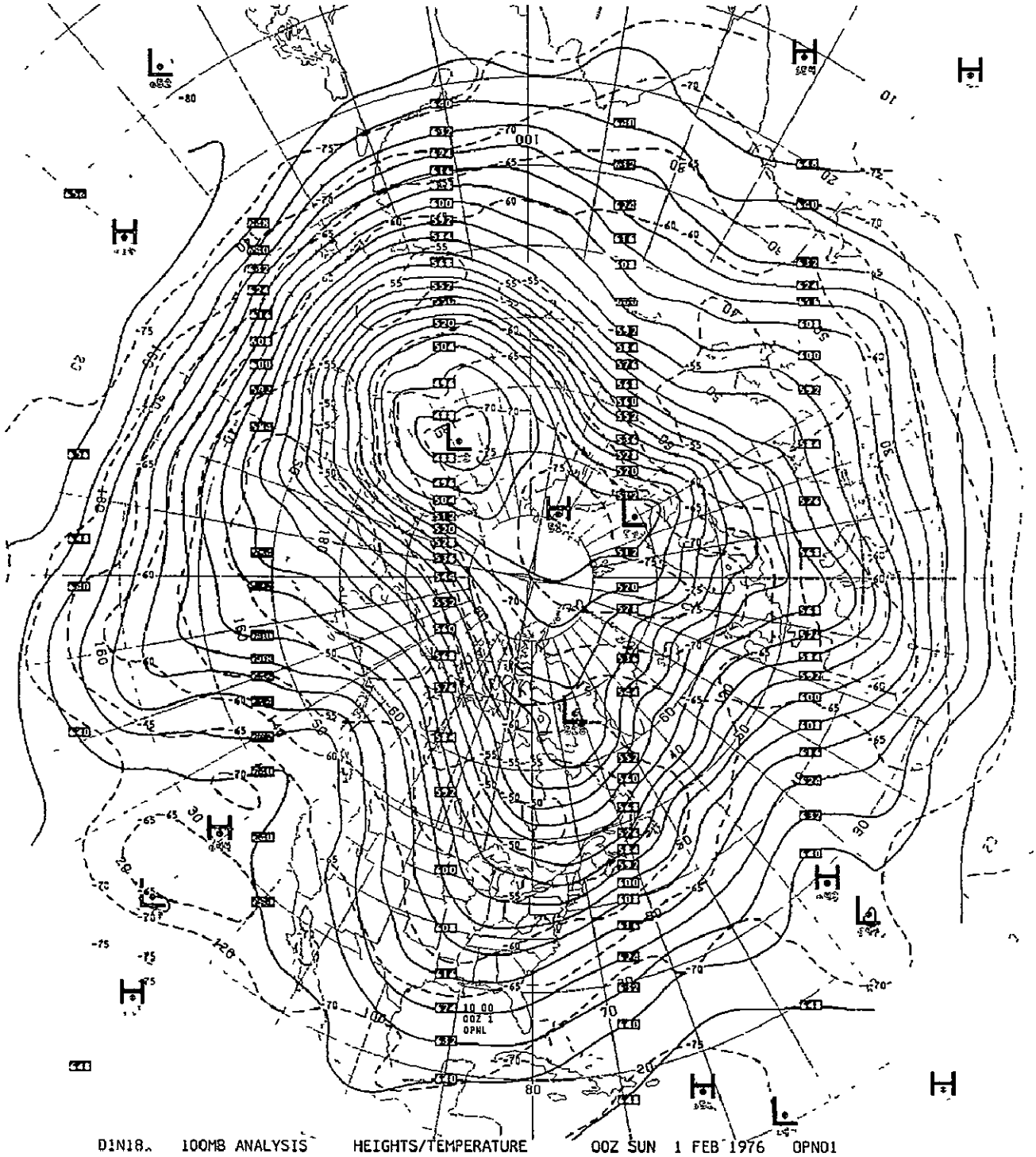

NIN14 500MB ANALYSIS HEIGHTS/VORTICITY 00Z SUN 1 FEB 1976 OPN01




DIN17 300MB ANALYSIS HEIGHTS/ISOTACHS 00Z SUN 1 FEB 1976 OPN01



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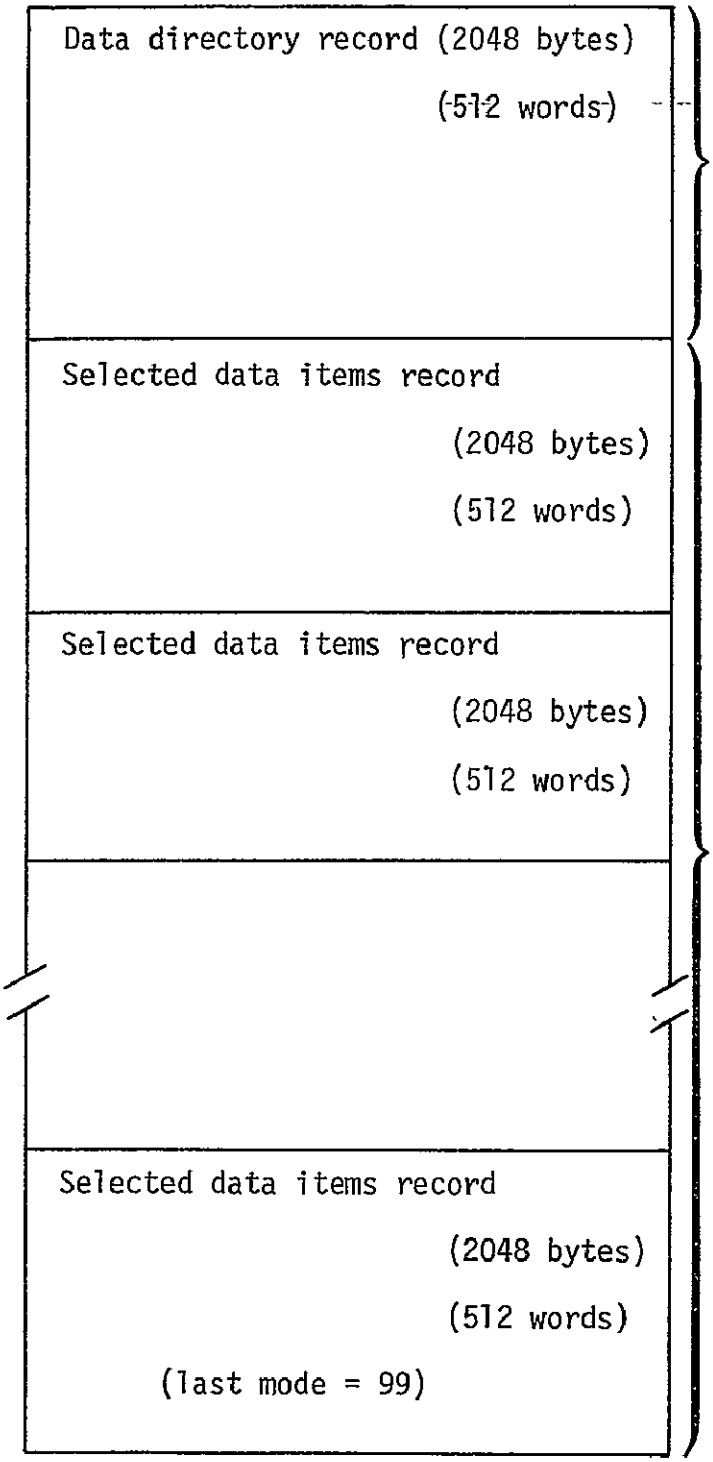
Appendix E.

Data Base Management Structure of Disk Resident Data

Level I SELECT Data Item File Structure



Header record is a data directory to the selected data items records (see Data Directory Record Structure and Format)

Records 2-N are selected data items records containing packed HIRS, SCAMS and RETRIEVAL items (see Data Item Record Structure and Format)

Level I SELECT Data Directory Record Structure

Number of Words	Description
8	Time period of SELECT window
2	Latitude boundaries of SELECT window
2	Longitude boundaries of SELECT window
1	Total number (N1) of HIRS data items selected
1	Total number (N2) of SCAMS data items selected
1	Total number (N3) of RETRIEVAL data items selected
N1	HIRS selected data identification numbers
N2	SCAMS selected data identification numbers
N3	RETRIEVAL selected data identification numbers
1	Total number of HIRS selected data ID ranges
1	Total number of SCAMS selected data ID ranges
1	Total number of RETRIEVAL selected data ID ranges
60	HIRS selected data ID ranges (lower ID, upper ID, increment sequence)
60	SCAMS selected data ID ranges
60	RETRIEVAL selected data ID ranges
remaining words	Zero fill

Level 1 SELECT Data Directory Record Format

Record Location: First (header) record in the SELECT data item file on disk

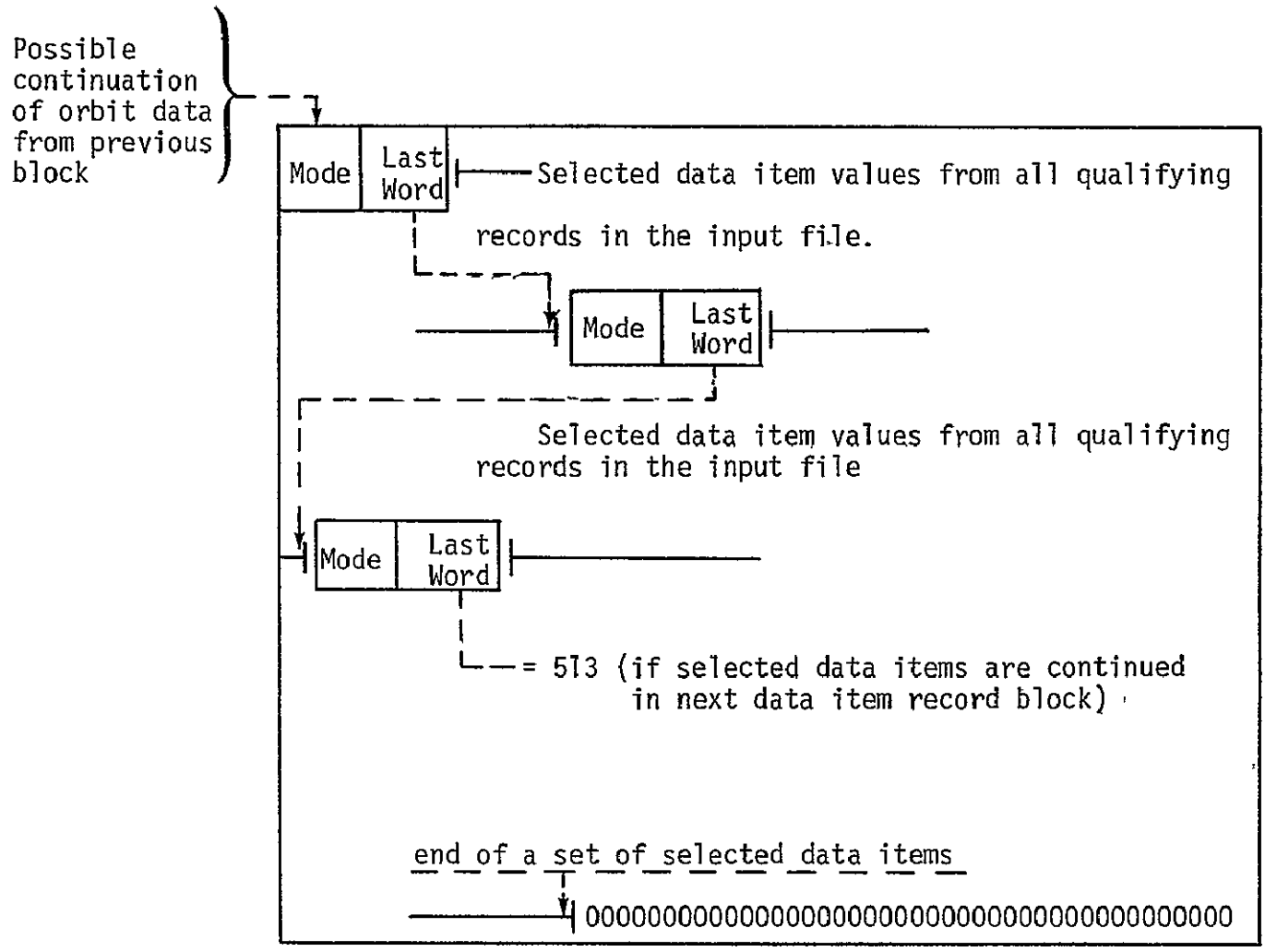
Record Size: 2048 bytes (512 I*4 words)

Word	Content	Description
1	DDD (integer)	Time window lower Julian date limit Where: DDD = Julian date (0-366)
2	HH (integer)	Time window lower hour limit Where: HH = hour (0-23)
3	MM (integer)	Time window lower minute limit Where: MM = minute (0-59)
4	SS (integer)	Time window lower second limit Where: SS = seconds (0-59)
5	DDD (integer)	Time window upper Julian date limit
6	HH (integer)	Time window upper hour limit
7	MM (integer)	Time window upper minute limit
8	SS (integer)	Time window upper seconds limit
9	XXXX (integer)	Lower latitude boundary of SELECT window Where: XXXX = latitude (deg) (neg=south) (min=-90)
10	XXXX (integer)	Upper latitude boundary of SELECT window Where: XXXX = latitude (deg) (max=90)
11	XXXX (integer)	Lower longitude boundary of SELECT window Where: XXXX = longitude (deg)(neg-west) (min=-180)
12	XXXX (integer)	Upper longitude boundary of SELECT window Where: XXXX = longitude (deg) (max=180)

Word	Content	Description
13	N1 (integer)	Total number of HIRS data items selected (N1)
14	N2 (integer)	Total number of SCAMS data items selected (N2)
15	N3 (integer)	Total number of RETRIEVAL data items selected (N3)
16	XXXX (integers)	First HIRS data identification number selected
" variable	"	"
" length	"	"
"	"	"
(N1+15)	"	Last HIRS data identification number selected
(N1+16)	XXXX (integers)	First SCAMS data identification number selected
" variable	"	"
" length	"	"
"	"	"
(N1+N2+15)	"	Last SCAMS data identification number selected
(N1+N2+16)	XXXX (integers)	First RETRIEVAL data identification number selected
" variable	"	"
" length	"	"
"	"	"
(N1+N2+N3+15)		Last RETRIEVAL data identification number selected
(N1+N2+N3+16)	XXXX (integer)	Total number of HIRS selected data ID ranges
(N1+N2+N3+17)	XXXX (integer)	Total number of SCAMS selected data ID ranges
(N1+N2+N3+18)	XXXX (integer)	Total number of RETRIEVAL selected data ID ranges
(N1+N2+N3+19)	XXXX (integer)	Lower ID no. boundary in first HIRS selected data ID range
"	XXXX (integer) For each range	Upper ID no. boundary in first HIRS selected data ID range
"	XXXX (integer)	Increment value through the selected data ID range

Word	Content	Description
Repeat for all possible HIRS select ranges (max. 20) (60 words)	XXXX (integer)	Lower and upper ID number boundaries and increment value through the selected data ID range.
"	XXXX (integer)	Lower ID no. boundary in last HIRS selected data ID range
"	XXXX (integer)	Upper ID no. boundary in last HIRS selected data ID range
(N1+N2+N3+78)	XXXX (integer)	Increment value through the selected data ID range
(N1+N2+N3+79)		
"	all integers	SCAMS selected data ID ranges (20 ranges/ 60 words)
"		
(N1+N2+N3+138)		
(N1+N2+N3+139)		
"	all integers	RETRIEVAL selected data ID ranges (20 ranges/ 60 words)
"		
(N1+N2+N3+198)		
(N1+N2+N3+199)-512 (i.e., remaining words in record)	0000	Zero fill

Level I SELECT Data Items Record Structure



Mode

1 = HIRS data (Integer *4)

2 = SCAMS data (Integer *4)

3 = RETRIEVAL data (Real *4)

99 = End record of file (no data remains following Mode)

Last Word = I*4 word location of last data item from input file (word before next Mode description) in relation to record block in core.

= 513 when next set of selected data items (from next qualified record) within the input file is continued in the next data items record.

Level I SELECT Data Items Record Format

Record Size: 2048 bytes (512 I*4 words)

	Word	Content	Description
	1	XXXX (integer)	File type mode of data items where: 1=HIRS data (I*4) 2=SCAMS data (I*4) 3=RETRIEVAL data (R*4) 99=End of file
	2	XXXX (integer)	Last I*4 word location of the last set of selected data items for the above mode (1 file) where: XXXX=word location in record block. If last word = 513, the next set of selected data items from the input file is continued in the next data item record on disk (IBUF(2) of next block will then point to the end of the input file's data)
Selected Data Items for one file	3	XXXX (integers) or	Selected data items from a single input record in the order of ID numbers as listed in the data directory for the mode Where: N=total no. of selected data items Selected items form second input record (if Mode=1 or 2, data is Integer *4 valued) (if Mode=3, data is Real *4 valued)
	N+2	RRRR (reals)	
	N+3	XXXX (integer) or	
	2N+2	RRRR (real)	
	"	"	
	Last Word	XXXX (integer) or RRRR (real)	Last select data item from input file
Selected Data Items for Next File	Last+1	XXXX (integer)	File type mode of next file of selected data items.
	Last+2	XXXX (integer)	Last word of next file's data items (513 = remaining data items from input file on a set boundary) continued in next record block)
	Last+3	XXXX (integer) or	First set of selected data items for mode Where M = total of data items selected for all modes)
	Last+M+2	RRRR (real)	
	Last+M+3	0000 (integer)	If all data items of a set selected from an input record do not fit in remaining record block words, the remaining words are zero filled and the next input record's data items are continued after the MODE and Last Word of the next record block
	512		

BIBLIOGRAPHIC DATA SHEET

1. Report No. 78042	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle AOIPS Data Base Management Systems Support for GARP Data Sets		5. Report Date October 1977 6 Performing Organization Code
7. Author(s) James Patrick Gary		8. Performing Organization Report No.
9. Performing Organization Name and Address Computer Systems Branch (Code 933) Goddard Space Flight Center		10 Work Unit No. 11. Contract or Grant No. 13. Type of Report and Period Covered System Description 10/76 - 9/77
12. Sponsoring Agency Name and Address NASA/Goddard Space Flight Center Greenbelt, Maryland 20771		14. Sponsoring Agency Code

15. Supplementary Notes

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OF POOR QUALITY

16. Abstract

This report identifies a data base management system developed at the Goddard Space Flight Center to provide flexible access to data sets produced by Global Atmospheric Research Program Project during its Data Systems Tests. This report defines the content and coverage of the data base and describes a computer-aided, interactive information storage and retrieval system implemented to facilitate access to user specified data subsets. The computer programs developed to provide the capability have been implemented on the highly interactive, minicomputer-based Atmospheric and Oceanographic Information Processing System and are referred to as the Data Retrieval System (DRS). Implemented as a user interactive but menu guided system, the DRS permits users to inventory the data tape library and create duplicate or subset data sets based on a user selected window defined by time and latitude/longitude boundaries. The DRS permits users to select, display, or produce formatted hard copy of individual data items contained within the data records. The DRS selection function is designed syntactically and supports user selection by single data items or by a start/end range of data items with an optional increment feature. Users may also produce temporary or permanent disk files of selected data for follow-on research studies.

17. Key Words (Selected by Author(s))	18. Distribution Statement
Data Base Management, Interactive Systems, Information Storage and Retrieval, Global Data Sets, Atmospheric Research	

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price*
		85	

*For sale by the National Technical Information Service, Springfield, Virginia 22151.